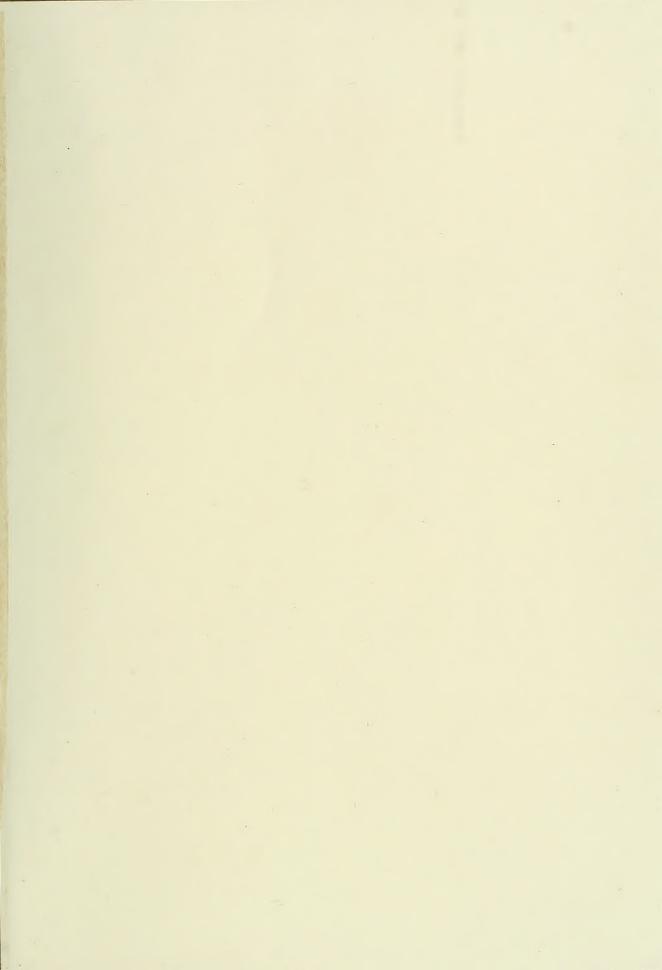
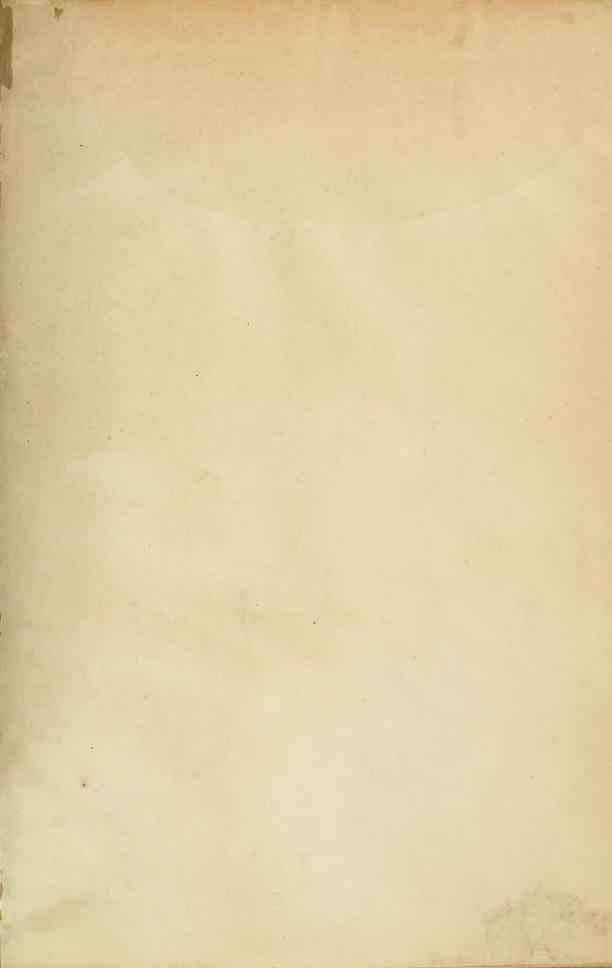




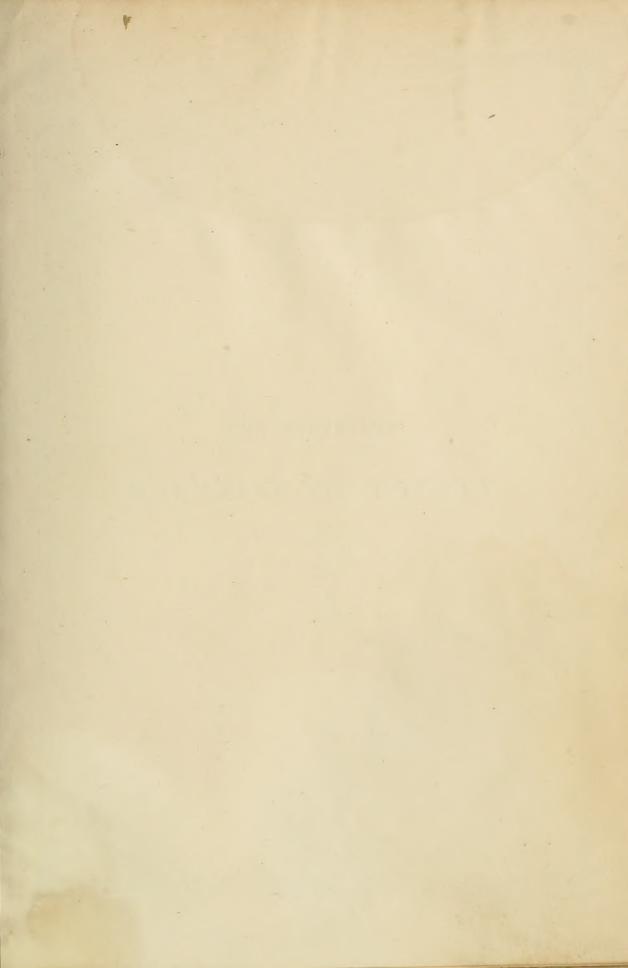
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THE GARDENERS'

MAGAZINE OF BOTANY.



## THE GARDENERS'

## MAGAZINE OF BOTANY,

HORTICULTURE, FLORICULTURE,

And Matural Science.

CONDUCTED BY

THOMAS MOORE, F.L.S., CURATOR OF THE BOTANIC GARDEN, CHELSEA; WILLIAM P. AYRES, C.M.H.S., BROOKLANDS, BLACKHEATH, KENT.

ASSISTED

IN BOTANY BY ARTHUR HENFREY, F.L.S., LECTURER ON BOTANY AT ST. GEORGE'S HOSPITAL; IN ENTOMOLOGY, BY J. O. WESTWOOD, F.L.S.; IN NATURAL SCIENCE, BY J. STEVENSON BUSHNAN, M.D.;

IN FLORICULTURE, BY MR. BARNES, DANE CROFT NURSERIES, STOWMARKET; AND IN JUDGING FLORISTS' FLOWERS, BY MR. GEORGE GLENNY, F.H.S.

JANUARY TO DECEMBER, 1851.

LONDON:

WILLIAM S. ORR AND CO., AMEN CORNER, PATERNOSTER ROW.

MDCCCLI.





#### PREFACE.

HE GARDENERS' MAGAZINE OF BOTANY has now been in existence for two years, its primary object having been to furnish the amateur and professional gardener with trustworthy information on all subjects connected with the science of his art. The Illustrations have chiefly consisted of Coloured representations of new plants worthy of cultivation, or of new varieties raised by the perseverance and skill of our cultivators. Another and higher object was however aimed at: it was the hope, both of the Proprietors and Conductors, that the attention of a large circle of readers might be awakened to the physiological principles on which the gardening art is founded, when these came to be expounded by one of themselves. It was also their desire that the Illustrations, whether Coloured Representations of Plants, or Engravings on Wood. should be of a character to cultivate the taste, and please the eye, as works of art, while they served to convey correct ideas of the habit and appearance of the plants themselves. These objects they claim to have done their part towards accomplishing, and they believe they may refer to the three volumes of the Magazine as combining an amount of information on Scientific Gardening, with high class illustrations, unequalled in number and character in any other Gardening Publication.

But while the performance of the promises with which this Magazine was ushered into existence, may be referred to with satisfaction, the Proprietors and Conductors are not unconscious that in more respects than one, the ground they have taken has been too high: the fact was to some extent overlooked, that the professional gardener, to whom they more particularly addressed themselves, did not always possess the means of spending his monthly half-crown on one periodical, however high his

appreciation of it might be. Experience has further shown them that among gardeners, the numbers who seek for Scientific Information and Technical Botany are a limited class; and although they have been honoured by support which has secured the highest circulation attained by any high-priced Botanical Publication, still that sale has fallen short of a remunerating point. Nevertheless, they still believe, and past experience confirms the impression, that there is a large class of readers who would gladly possess themselves of a work presenting good illustrations along with trustworthy information, if produced at a price placing it within their reach. Such a work the Proprietors are now preparing to submit to their present readers and the gardening world, as a worthy successor to "The Gardener's Magazine of Botany," in "The Companion to the Flower Garden," a Prospectus of which will be found on a subsequent page.

In taking a respectful leave of their subscribers and readers, the Conductors beg most warmly and sincerely to thank their many kind friends for the aid by which their own labours have been sustained, and which has resulted in the completion of a series of volumes, such as Contributors, Conductors, Artists, and Publishers, may alike feel a just pride in having been instrumental in producing. They would also take the opportunity of gratefully acknowledging the many encouraging assurances of approbation which have met them on all hands;—of again extending the hand of fellowship which was held out when they commenced their labours; and of expressing a hope that the friendly intercommunication which this publication has been the means, directly or indirectly, of promoting, may not be interrupted by the present change.

LONDON, November, 1851.



On the First of January, to be continued Monthly, Price Eighteen Pence,

WITH TWO COLOURED PLATES AND SIXTEEN PAGES OF LETTERPRESS, INTERSPERSED WITH WOOD ENGRAVINGS,

THE

### COMPANION TO THE FLOWER-GARDEN:

OR,

HINTS ON GENERAL CULTIVATION, FLORICULTURE, AND HOTHOUSE MANAGEMENT, WITH A RECORD OF BOTANICAL PROGRESS.

This Work will be chiefly confined to Flower-culture and Botany, being intended to form a Monthly Record, with faithful representations, of such Plants,—whether newly-imported species, or new varieties of Florists' Flowers, as are deserving of extensive cultivation. Each Part is intended to contain Two Plates, drawn from nature, and coloured in every respect equal to those in the "Gardeners' Magazine of Botany," with Sixteen Pages of Letter-press, interspersed with Vignettes and Engravings on Wood.

The Plates will, as far as possible, be allotted so as both to represent the finest Florists' Flowers as they come into bloom, and the most interesting and newest Flowering Plants imported during the season, or flowered for the first time in this country. In each case, when the subjects admit of it, two or more figures will be grouped together, so that three or four subjects may frequently be represented on the Two Plates.

The Letter-press will consist of popular descriptions of the Coloured Illustrations, with their history and cultivation in plain and popular language, with due precision, but without any attempt at technical description; Notices of New Flowering Plants from Public and Private Gardens and the Nurseries, accompanied by Wood Engravings of the most remarkable of those which the Plates will not suffice to illustrate; and a record of Botanical progress derived from personal observation, or gleaned from the foreign journals, and from the proceedings of the Societies.

As it will be the object of the Conductors to place before their readers information on all the best and newest Flowers and Plants, with Illustrations of them, it will be the interest of Cultivators residing at a distance from London to acquaint them, from time to time, with the existence of novelties worthy of being figured, described, and cultivated. All such communications will be treated with attention and impartiality.

LONDON: Wm. S. ORR & CO., AMEN CORNER; AND 32, NORTH JOHN ST., LIVERPOOL;

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M.

2013





SKETCH OF A CONSERVATORY FOR TROPICAL PLANTS.

# The Gardener's Magazine of Botany.

#### ON THE PICTURESQUE IN HOTHOUSES.

By H. N. HUMPHREY, Esq. HE usual internal arrangements of a hothouse—or stove, as such a structure is more commonly called-are such as to render a visit to its botanical treasures anything but a luxury; on the contrary, in an artistic point of view, it is too often utterly unworthy of notice. The most rare and beautiful plants are usually put away as closely as they can be packed, with only room sufficient, as it were, to pass round them for the vulgar purpose of counting or numbering them, like so much common merchandise: this is surely not treating a collection of the most exquisite creations of nature with due respect. The expense of creeting a structure of sufficient size to exhibit a large selection from the flora of the tropics, so as to give adequate space for the full display of the habit and character of each individual plant, is not an argument against the position just assumed, inasmuch as it would surely be more consistent with the highest principles of taste that the collection should be small, but spaciously, elegantly, and conveniently exhibited, rather than that it should be large, and stowed away like merchandise in a warehouse. Where the plants are cultivated for sale, it is of course necessary that they should be grown in as small space as possible; even where a collection is made for the

purposes of scientific study only, it may be equally necessary to abandon all idea of picturesque arrangement, in deference to convenience of reference, or the introduction of a greater number of genera. But where a structure for their growth is considered in the light of an elegant, luxurious,

and instructive appendage to a private residence, all reasons for rendering its arrangement inconvenient and repulsive, disappear, and leave the ground clear for attempting some improvement which shall render the hothouse a more picturesque and attractive object, than, in ordinary cases, it has hitherto been.

There are many modes in which such a structure might be rendered both picturesque and interesting. The present paper embodies a theory that has long been a very favourite one with me. A principal feature is to relieve the spectator from the impression that he is walking under glass,—thus destroying the illusion of a tropical scene, which the plants around him would otherwise convey. I propose to effect this by making the framework or skeleton for receiving the glass, of irregular forms, resembling interlacing branches of trees, which would greatly tend to encourage the illusion that the openings between the branches were actual openings, and not glazed. This effect may again be considerably heightened by training climbing plants over some of the framing branchwork, as though climbing the trunks of natural trees, while others of the simulated branches should be left bare. Bananas and Palms, by occasionally reaching near to the branch-work roof, would still farther aid in concealing its artificial character. In an experiment on a small scale, I would only have a path through the centre, so that the sides should also be concealed by plants rising above each other on an irregularly formed bank.

Through the centre of the house a stream of tepid water should flow, in which, amid fragments of rock and large boulders, aquatic plants of the tropics should be seen displaying their wildest habits, and assuming all the varieties of character which they exhibit in their natural localities. This stream might also be enlivened, not only by gold-fish, but by other species of curious fresh-water fish of the tropics, and its borders might be enriched by shells suitable to the natural climate. The stream could be made to assume the appearance of a partially-dry forest torrent, such as would during the hot season leave a sandy or pebbly beach on either side of its diminished waters; these again might form two pathways through the midst of this miniature forest imitative of an Indian or Brazilian climate.

Some of the very finest Ipomœas and Passifloras might form the matted foliage above, interspersed with the heads of a few trees and fine Palms of large foliage, without strictly confining the selection of trees to such as would be proper in forest scenery. The undergrowth should be intermingled with gigantic ferns and other green plants, to form a rich background for highly coloured flowers, which should be such as would flower best with only a moderate degree of light. A selection of very splendid plants might easily be made, which would actually flourish best under these circumstances, and the wild and forest-like effect of such a scene might be greatly heightened by the addition of a few of the more brilliant and sweet-scented Orchids suspended from the roof.

Another addition to the scene,—one which I have alluded to in another work,—is the introduction of exotic butterflies, which, in such a situation, fluttering from flower to flower, opening and closing their gorgeous wings, and exhibiting their rich metallic hues in various lights, would impart a tropical life to the composition hardly to be obtained in any other way. This experiment might very easily be tried, as the capture and sale of tropical insects has become quite a trade in districts where they are remarkable for their beauty. The men employed in this pursuit might easily be instructed to procure chrysalids instead of the perfect insect; and in the chrysalis state they are easily packed for carriage without the slightest risk of injury. Chrysalids so imported might be placed in secure positions in a hothouse of this description, and when the time arrived for the perfect butterfly to come forth, they would find a temperature suitable to their constitution and structure; and if they did not become the parents of future broods, they yet would exist during their own natural term of life, and a fresh importation could be made in the next season. In some cases, the eggs might be imported, as those of the silkworm are, care being taken to provide the peculiar plants on which they feed, and this would probably prove the most effectual mode of naturalizing a family of exotic butterflies in an English hothouse.

The structure I have been describing would not exhibit attractive features on the exterior, which should therefore be concealed by shrubberies—placed at sufficient distance, however, not to impede the light; and the small open space between the building and the shrubbery might be made use of for raising cuttings or other unsightly operations where concealment is desirable. I propose that the approach to the "tropical forest" should be through a valley of rocks well clothed with yuccas and other plants of exotic appearance that yet bear our climate well. In this piece of rock-work, a tunnel, or passage might be constructed, containing a door—the actual door of the hothouse, but which will not be seen from the interior of that structure, being concealed in the rocky passage. On emerging from the comparative darkness of this passage, the height, light, and general dimensions of the building will expand upon the eye in a very striking manner, while the illusion will not be destroyed by the act of unlatching a glass door to effect an entrance—the door and all its appendages being concealed in the tunnel. When within the structure, the spectator, will only perceive, on looking back, a group of rocks with a cave-like opening, the exit at the other end being managed in a similar manner.

BOTO

The stream of water should enter at one end among the trees, and wind to the centre, as it appears in the accompanying design,—at the other extremity it should, in a similar manner, turn among the trees, and find its exit at a concealed point, leaving the centre of each end free for the rock-work entrance and exit. The water could be warmed to the necessary temperature by pipes passing over the general heating apparatus previous to entering the building.

The object of the following design is to show how, in quite another style to the one above described, a conservatory may be made highly decorative, so as to produce a more gardenesque effect than is usual. In the first place, the walks are intended to be of fine gravel instead of the chilly and ungardenlike tile



SKEICH OF A JARDIN D'HIVER, OR ENGLISH CONSERVATORY

floor generally used. Secondly, the centre part of the building, instead of being choked up with tall shrubs and trees, is to be kept spaciously open, low-growing plants only being placed in the ground as in a flower-bed, in the central compartments. These plants are to be brought from a reserve house when in perfection, and removed in succession as they get past their best, their places being filled with fresh ones. The side walks, which cannot be shown in the drawing are to have a bank next the glass filled with plants in flower, like those of the central beds, and these walks are likewise to be of fine garden gravel. The plants in the vases, &c., are intended likewise to be removed continually, the only permanent ones being the palms and larger shrubs planted in the ground in the central and most lofty compartment of the building, and the climbing plants attached to the supports and the roof.\* Large seats, of bold design, either of stone or of wood painted stone-colour, should be placed at certain distances apart, and a well designed circular seat is meant to extend all round the group of aloes and other plants in the centre.

A spacious and pleasant promenade might thus be arranged, which, in wet weather, would be no contemptible substitute for the garden itself, while, during four or five months of the year, it would form a true jardin d'hiver, to which a covered passage might be constructed from some conveniently situated room, which can be visited from the house without passing into the open air.

The roof of this building is not intended as a model for execution,—being merely a rough sketch introduced to exhibit the interior arrangement.

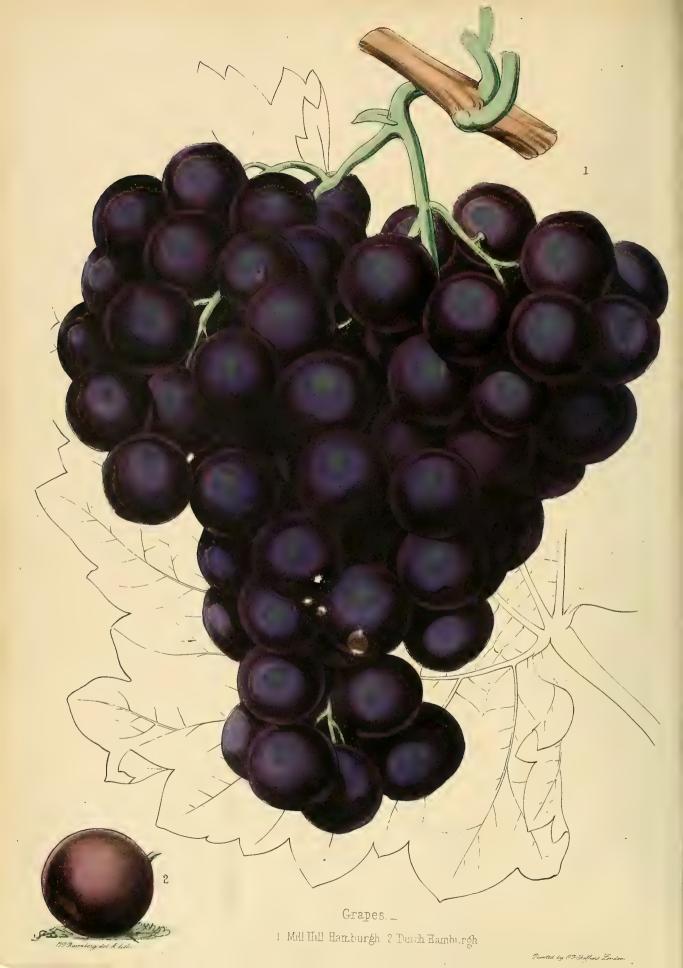
As a place where pleasant exercise might be taken daily among beautiful trees and flowers, there can be no comparison between the house just described, and one in which the whole building is so choked up with plants and flower pots, that there is no room to move;—where the air is so overladen with close earthy smells, that any sensation of pleasant or healthy exercise within its heavy atmosphere, must at once evaporate, as inconsistent with the place.—H. N. H.

#### THE MILL-HILL HAMBURGH GRAPE.

MOWEVER cautious a man may be, it frequently happens that in purchasing new fruits M he is deceived, and hence it has become a matter of considerable importance that they should be thoroughly proved before being recommended to the public; for nothing can be more disheartening to a purchaser than to find, after perhaps years of care and attention, that his plant when it comes into fruit proves to be a useless thing. The grape under notice is a very distinct variety of Hamburgh, and so perfectly distinct that no person need fear for a moment to plant it—indeed, if proof were wanting of its quality, no stronger or more satisfactory evidence could be adduced than the fact that the late Mr. Wilmot of Isleworth planted last spring one of his largest vineries with this kind alone—so convinced was he of its suitability for market purposes. On the 1st October, 1850, Mr. Fleming, the Duke of Sutherland's clever gardener at Trentham, sent some bunches of this grape to exhibit before the Horticultural Society, and at the same time he sent some of Old Dutch Hamburgh. The same day we received from Mr. Fleming the bunch from which cur plate was prepared, and also some of the Dutch Hamburgh, and a drawing of a most remarkable bunch of another new grape grown at Trentham, and called the "Pope Hamburgh." With the grapes sent to the Horticultural Society was the following memorandum, which we quote from the Society's Journal: -Mr. Fleming observes: "Many persons being doubtful as to the existence of any real difference between the Mill-hill Hamburgh and the common one, and others confounding the Mill-hill with the Old Dutch Hamburgh, I send some of each, in order that the question may be decided. The Mill-hill is later in ripening than the common Hamburgh, and its skin being firmer, renders it a good keeping grape. The vine makes strong roots, and, unless means are taken to keep them out of the subsoil, they will soon be reveling in it, and the wood will not ripen well. Our border is shallow and concreted below, and the wood ripens perfectly. This grape is in my opinion the best of the late black kinds, and seems to be a cross between the Black Damascus and the Hamburgh, but partaking more of the latter. The grape, which I call the Old Dutch Hamburgh, is large in the berry, of excellent flavour, and very juicy. It does not always become black, but with us is often of a flame or red colour, in which state it is much admired. The fewer the number of berries left upon the vine the nearer to black do the berries approach, although I have never seen them perfectly black. There seems to be much confusion of names among the grapes. We have here no fewer than four kinds of Hamburghs, all of which I have tried in one house, and, for early forcing, none excels the 'Pope,' a grape for many years grown most successfully at Swinnerton Hall in this county (Staffordshire)." To this history we may add that the Mill-hill vine is a strong grower, with the foliage, as will be seen by the piece represented, very coarsely but regularly toothed. In form of bunch and berry it appears midway between the Hamburgh and Black Damascus, the shoulders being compact and the pedicels of the berries very strong—the flavour is rich and juicy, and the flesh is rather more firm than the common Hamburgh. We regard it as a perfectly distinct and excellent kind, most admirably adapted for late keeping. The variety was raised some eighteen or twenty years back from seed of the Black Hamburgh, in the garden of Miss Crompton at Mill-hill, near Derby, where the original plant may be seen; the place being now in the possession of T. B. Bainbridge, Esq. It found its way into cultivation mainly we think through Mr. Barron of Elvaston, who sent it to Trentham.

Respecting the Pope, we strongly suspect it, from the few berries we have seen and the circumstance of its ripening before the Hamburgh, to be identical with the Welbeck Black Tripoli, and this impression is strengthened by the fact that the Welbeck Black Tripoli was





brought from Italy by the Duke of Portland. We believe there is no better black grape; but from cuttings received direct from Welbeck, only two out of seven vines which we planted proved to be right,—the others being common Hamburgh; and hence, to some extent, we know that kind was sent out for the Tripoli.

We had intended to have given an engraving of the bunch of the Pope grown at Trentham, but as our page would only take about one quarter of the bunch, and as to reduce it would destroy the interest connected with it, we are compelled to confine ourselves to a statement of the dimensions: length, ten inches; width across the shoulders, eleven inches; probable circumference, three feet. We append a very admirable article by Mr. Fleming, in which his experience in connection with the Mill-hill Hamburgh is fully stated.—A.

#### OBSERVATIONS ON THE MANAGEMENT OF GRAPE VINES.

By Mr. FLEMING, GARDENER TO THE DUKE OF SUTHERLAND, TRENTHAM.

MHE Mill-hill Grape was brought into notice a few years since, having been grown at a gentleman's seat near Derby, from whence, through the liberality of the proprietor, it soon found its way into several gardens in the neighbourhood, and, from the size and beauty of the berries, it became in a short time generally sought after. Mr. Barron, of Elvaston Gardens, favoured us with a few eyes of it, from which were raised sufficient plants to furnish a house in 1846. The vines, which were planted on a well made border, eighteen inches deep, resting on a concrete bottom, having a rapid fall and plenty of rough material to drain off the superabundant moisture, grew rapidly and ripened their wood well from the beginning; and five splendid crops have since been cut from them. The excellence of this grape is now beyond all doubt; not, however, as an early forcing one, as it does not ripen so early by a fortnight as the old Black Hamburgh; but on account of its fine size and colour, and from its hanging so long after it is ripe. A Black Grape, possessing the qualities of size, colour, and long keeping, being so much required for winter use along with the Muscat of Alexandria, and Charlesworth Tokay, (than which there are no better white grapes), I feel pleasure in stating what I know of the Mill-hill. With some the wood does not ripen well, but this must be occasioned by deep moist borders, as our Vines, which are pruned upon the close spur system, have ripened every inch of wood which they have been allowed to make since the second year. The bunches of this grape are not large, but they are well shouldered and handsome. The berries, which are round and indented, are as large as the Black Damascus. The leaves are of a more regular form than the common Hamburgh, being nearly circular, less deeply serrated, and the upper surface smoother and of a shining dark green.

The "Pope" Grape is another kind of Black Hamburgh, which is well worthy of culture from its being the earliest and sweetest of the numerous varieties of this really useful and most generally grown vine. It is the only kind of Hamburgh grown by Mr. Robertson at Swinnerton, near Stone, in Staffordshire; and we have seldom seen finer crops than he obtains. The bunches are large and handsome, and black as jet; and the berries, although not so large as what is called "Wilmot's Victoria," are better flavoured. The "Pope" Grape is the best forcing one we have tried, being a free grower, an abundant bearer, and becoming well flavoured even when ripened in February or March. It is the best of its class to plant in small houses for producing early crops.

Next in importance to having Grapes early, is having them to keep late; and, after trying several experiments, we have found the Charlesworth Tokay to keep longer without shrinking than any we have grown. Its flavour is very similar to the Muscat of Alexandria, and from its being of a more robust habit and setting freely, it is a more desirable vine. The Muscat of Alexandria, grafted upon the White Tokay, keeps its fruit longer in a plump state then when on its own roots, which, we believe, is owing to the latter being a strong rooting vine, which grows very late in the season. We have the White Tokay here as a stock for the Muscat, with leaves still upon it; while the leaves of the Muscat grafted upon it have ripened perfectly and fallen more than a fortnight. The fruit upon the grafted vines are of a beautiful amber colour, and quite fresh; while those on Muscats of the same age on their own roots are shrinking.

Grafting, budding, or inarching vines of the late keeping kinds is much to be commended; for, although the size of the berries is smaller, the flavour is improved; and judging from our experience of the last few years, the fruit keeps three weeks or a month later.

. January 8th.

The best time for budding Vines is when the sap is flowing freely into the buds in spring, and when the leaves are commencing to unfold. If done earlier they will bleed, and thus weaken the stock; whereas Vines do not bleed if wounded after the leaf begins to unfold, unless a shoot or branch be cut off. A strong stem of a Vine may be budded all over with one or several kinds, and if the operation is performed skilfully, and at the critical moment when the Vine is just coming into leaf, an inferior variety may by this means be made to bear the best kinds of grapes in one year after budding, thus offering the readiest means of making the best of what has often to be considered a bad bargain, and the cause of much disappointment, as in the case of Vines purchased under a wrong name. The sketch

will show clearly the way in which I have budded many Vines, all of which have done well. As soon as the bud is nicely fitted into its place, it is tied tightly and neatly with bass, clayed over as in grafting, and a little



moss tied upon the clay to keep it moist. Care must be taken to keep the bud exposed, so that it may be able to grow without interruption from the surrounding material; and the moss should be moistened several times a day. As the buds begin to grow, the shoots of the Vine or stock must be gradually diminished in number until they are all removed, or they may be stopped in constantly through the season, to give all the vigour of the stock to the buds. About Midsummer the matting round the buds should be gradually slackened, and in a week or two afterwards the union between the bud and stock is perfect; afterward it may be wholly removed. We have had a crop from the main Vine the same year that the buds were inserted, and thus no time was lost.

Inarching is a most successful method for changing the kind of grape without doing away with a healthy Vine, which may, perhaps, be more suitable for the soil in which it is growing than the kind it is desirable to have in its place. When this plan is to be adopted, a healthy young Vine of the kind desired should be procured in a pot, and placed in the same house with the old or existing Vine before either begins to grow, in order that they may advance together, and be as nearly as possible in the same state when the operation is performed; the best time for which is when the young shoots have grown about four feet in length. The Vinc in the pot should then be brought so near to the shoot to which it is to be attached, and placed in such a position that they can be readily united. bark and a thin slice of the wood, four inches in length, should then be carefully removed from each, about three feet from their points; the two parts thus cut should then be fitted exactly together and tied neatly, taking care not to injure the soft young wood. Moss the part over, and the business is done for the present. In about three weeks the ligature will require loosening: but care must be taken not to disturb the shoots, as very little will separate them. Every encouragement should be given to the inarched vine, by removing gross shoots from the stock during the summer; and, at the end of the season, the vine in the pot may be carefully cut below the junction. If all goes on well, fruit may be expected the following year.

In cold damp places, where the more choice grapes do not succeed well, I would recommend planting the strongest vines, such as the Nice or White Tokay, and budding or inarching the Muscat or other choice kinds upon them. The success which has attended the experiments we have tried here is most satisfactory.

### Carden Vints for Amateurs.

FEBRUARY.

AVING in our preceding volumes given a very complete Calendar of garden operations suitable alike for practical gardeners, and for the amateur, it is our intention to confine ourselves during the present year to the amateur's garden only; but still we hope to render the hints sufficiently lucid to be, as far as they go, seasonable remembrancers to practical men. The fruit-forcing department will be omitted, as it is considered those who force fruits have generally a gardener to attend to it.

Plant-Houses and Pits.—This is a busy month in the greenhouse, as all plants which require it should be re-potted before the end. With lengthening days there is no fear of starting young plants into active growth, and such things as young Azaleas and Croweas must be cut in, and introduced into strong heat; Boronias, Eriostemons, Chorozemas, Zichyas, Aphelexes, Leschenaultias, Pimeleas, Polygalas, and Styphclias, into a warm greenhouse, where they can be kept rather close, and some of the free-growing Heaths may also be forwarded a little. In potting it is scarcely necessary to state, that soils

of the very best description must be used, for without this precaution and careful potting all other attention is thrown away. If the soil has been properly harvested and exposed to the action of the atmosphere. break it into pieces, and remove every particle but the turfy part; break that into small pieces, pass it through a half-inch sieve; mix it with suitable proportions of sand, charcoal, and potsherds broken small, and quite clean, and you have the main requisites for the cultivation of hard-wooded plants. Some such as Pimeleas, Chorozemas, Polygalas, Dillwynias, Correas, Bossicas, &c., will be benefited by an addition of one-third or fourth of nice mellow Epping loam; but always bear in mind that almost every known plant will flourish in peat and sand, and therefore do not run unnecessary risks with loams. Clean pots form another important element of success, and cleanliness in every particular must be attended to, even to the washing of plants with soap and water if necessary. Camelliæ are now progressing rapidly; take care to supply them with plenty of water, more especially if the weather should render it necessary to use strong fires. Some of the soft-wooded plants, such as Pelargoniums, Calceolarias, and Cinerarias, will now be growing rapidly; supply them liberally with water, pot if necessary, and keep a sharp look out for insects and decaying leaves, which must be removed instantly, especially from the Fancy Pelargoniums, or they will be sure to rot the stem of the plants. If the plants are much crowded with foliage thin a part of the smallest out, so as to admit of a free circulation of air, and train the plants in a regular and uniform manner. A few plants of Fuchsias must also be started, and some of the finer kinds of Mimulus, such as Ruberrima, Conductor, Harlequin, Formosa clegans, &c., will make a good show if grown freely from this time. On bright days a slight syringing three or four times a week will be of benefit to the plants. Fumigate to prevent green fly.

Stove and Forcing-House.—In addition to the regular occupants, many of which, such as the Begonias, Gloxinias, and Gesneras, will now be very gay; room must be found here to forward Azaleas and Camellias, a few American plants, Roses, and some bulbs. The Dipladenias, Allamandas Ixoras, and Stephanotes, must also be started if wanted early, and the various kinds of Achimenes,

Gesneras, Gloxinias, and other bulbous stove plants must also be attended to.

Propagating Pit.—Here a busy time is at hand, not only to provide stock for the flower-garden but also to increase such stove plants as are required for winter blooming. Examine your stock, and introduce plants of such Verbenas, Petunias, Heliotropiums, &c., as you require plants of; and Tea, China, and Bourbon Roses, may also be increased rapidly at this season. If the pit is heated by a tank you will have little trouble with it, but if you have to depend upon tan or dung linings for bottom heat, take care to keep a good stock of fermenting articles always ready for use, so that the pit suffers no decrease of heat.

Cold Pits and Frames.—Attend to young stock in these, and see that they are properly protected in severe weather; clear the plants frequently of dead or decaying leaves, stir the surface of the soil, and keep the plants as clean as possible. Sow a successional crop of Mignonette on a slight bottom heat, using a rich soil. Repot stocks, and encourage them, and prepare fermenting materials for beds on which to sow tender annuals next month.

Florists' Flowers.—These, owing to the mild weather, are unusually forward; and hence, as the roots will soon suffer for want of room, no time must be lost in getting Carnations and Picotees into their blooming pots, taking care to protect them from heavy rains afterwards. Where Auriculas and Polyanthuses are showing prematurely, as many are this season, nip the flower stem out, stir the surface soil, and top dress with suitable compost. Give plenty of air, but guard cautiously against frost. If large quantities of Dahlias are wanted, introduce some of the best into heat to produce cuttings, but under ordinary circumstances, March will be soon enough to start them. Attend to Pinks. See that they are not blown about by the wind, and press the soil firmly around them if in a suitable state. Punsies will require much the same treatment. Remove flower buds from those in pots, and encourage them as much as possible. Transplant any to borders which it is wished to flower in that situation, giving a deep and highly enriched soil. Ranunculuses must also be planted when the ground is in suitable condition, and Tulips must also be protected should the weather prove severe. When a large increase of Phloxes or Hollyhocks is required, a few plants in pots, introduced into the greenhouse will produce abundance of cuttings.

Flower Garden and Shrubbery.—Alterations in these departments must be proceeded with as quickly as possible, such as trenching, renewing and replanting beds, levelling ground, or altering the form of walks or borders. If a fine display of flowers is wanted, nothing is so necessary as to have deep and porous borders; but they should not be too rich, as, in that case, the plants in rainy seasons are liable to run too much to foliage. It is better to depend upon manure water for enriching the soil in case of need. Prune roses towards the end of the month, and finish planting if not already done. Established plants, after they are pruned, will be much benefited by having the soil removed about

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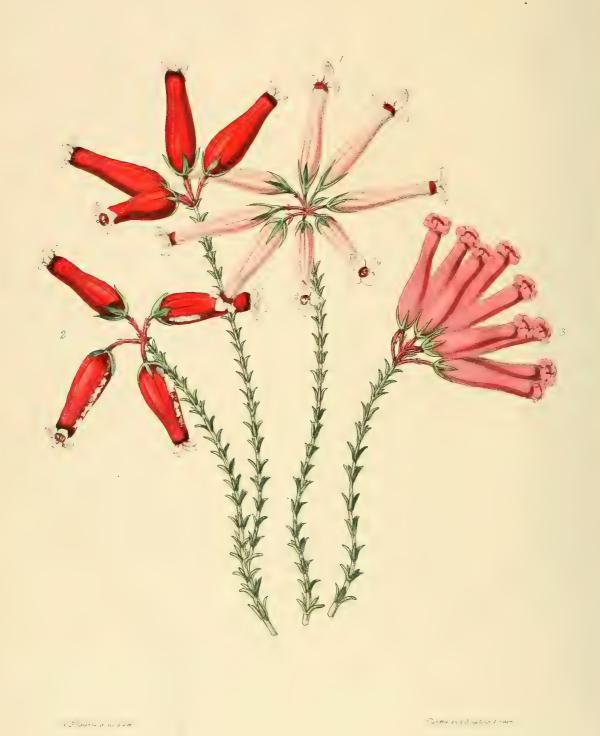
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their roots, and receiving a good soaking of rich liquid manure, sufficient to enrich the ground thoroughly. Finish pruning, nailing, and training, roll the grass frequently, and keep everything as neat as possible. Where the bulbs are through the soil, hoe deeply but cautiously, and should the weather be very severe, Tulips and Hyacinth beds may be matted over, or be protected by a few evergreen branches. We say nothing of the digging of shrubbery borders, as that is a relict of barbarism more honoured in the breach than the observance.

Forcing Garden.—Where dung has been prepared, a bed may be made up for Cucumbers, but a pit with a flue or tank will produce them with much greater certainty and at a tithe of the expense and trouble. Cucumber plants can generally be procured from a neighbouring garden, but if not, a bed for a single light box must be formed to raise them, which will also do for a few pots of Melons or for other purposes of propagation. Keep a good stock of dung, dung and leaves, or dung, leaves, and tan always prepared, and make up a bed for Early Potatoes, Carrots, and Radishes, which may be grown either under mats or in frames. Attend to successional crops of Sea-kale and Rhubarb, and any old beds of Asparagus may be taken up and forced on a gentle hotbed. Make another bed for Mushrooms, and sow Mustard and Cress for successional crops.

Kitchen and Fruit Garden.—Presuming that all operations connected with manuring, trenching, and preparing the ground as it became vacant, have been attended to, it only remains now to take advantage of frost or fine dry weather to fork the soil over frequently, more especially where it is of an adhesive nature, so as to get it into a finely pulverised state prior to sowing the seeds of such crops, as it may be necessary to sow; for, upon that, as much as upon the quality of the seed sown, must you look for a vigorous and healthy growth. Where the soil is very adhesive, even under the best management, it is, more especially in rainy reasons, found exceedingly difficult to form drills for small seeds, and still more difficult to find earth in suitable condition to cover the seed when sown. Under such circumstances it will generally be found best to form the drills for small seeds with a strong pointed stick, as being less likely to consolidate the earth, and to cover the seed with light charred refuse, or compost of any light kind. Thus treated, small seeds will generally, we may say, invariably vegetate some days sooner than if covered with common soil, and hence the season of greatest danger to the seed, the time between the first process of vegetation and the young plant appearing above ground, is considerably shortened, and the chances of the plants being destroyed by frost, to a great extent removed. On heavy soils, the plan of throwing the ground into sloping banks is an excellent one, as if the ridges point east and west; there is a south bank for early, and an equally useful north bank for late, crops. Proceed with the planting of potatoes of all kinds as quickly as possible, recollecting that early kinds are almost sure to yield a crop, but that there is some doubt about late ones; therefore place your dependence on early kinds. The following are first-rate sorts, comparatively unknown, but of considerable merit: -Red Ash-leaved Kidney; Hague's Seedling, or Lapstone; Thurston's Conqueror; Martin's Superior Frame; and Soden's Early Oxford. These, with the true Ash-leaved Kidney, may generally be depended upon for producing a fine crop of excellent quality in almost every kind of soil. The new Black Potato is the best late kind we know; we were using it last season long after the new potatoes were full grown, and then it was quite mealy. If the first crop of Peas is not in, sow a row or two of Warner's Emperor, or Flangan's Early; but if you want good Peas rather than early ones, any of the following will be more likely to suit your purpose :---Fairbeard's Surprise, and Champion of England; Bishop's New Longpod, Burbidge's Eclipse; Hairs' Dwarf Mammoth, Knight's Marrow, which we consider the best Pea in cultivation, though in our last bad Pea season it did not succeed in some soils. The above, with the true Scimetar, are all the Peas an amateur, or, indeed, any one else need care about. Sow also Longpod, Royal Cluster, or Windsor Beans for a main crop. Parsnips may also be sown towards the end of the month, and successional crops of Scarlet Short-top, and Turnip Radish. In a warm sheltered situation, a bed of Scarlet Horn Carrot, with a little Lettuce, also may be got in. Plant out successional crops of Cabbage, hoe and stir among growing crops in suitable weather, and wage a war of extermination against slugs and insects of all kinds. The planting of fruit-trees must be completed without delay, taking care to mulch the roots with leaf-mould, or decayed dung; top-dress Strawberries with leaf-mould if you can spare it; or, if not, hoe deeply and dress them with soot, which is an excellent manure for this crop. Proceed with pruning and nailing in suitable weather, and protect the Apricots, Peaches, &c., directly the buds begin to swell, as possibly you may do as much good by shading and retarding the blossom, as by protecting it after it is open. Of the various plans recommended, we have a strong notion that branches of evergreens placed thinly about the trees are as good as anything. We apply them early, and begin to thin them out gradually when the fruit is the size of small peas. Do not forget the thinning of orchard trees if the branches are crowded.—P.





I Erica Pouglasia: 2 F Marnochana, 5 E Simulata

#### ERICA: TURNBULL'S HYBRIDS.

Nat. Order, - ERICACEÆ & ERICE.E.

Generic Character.—Erica, Linnæus.—Calyx four-toothed or four-parted. Corolla hypogynous various—globose, urceolate, tubular, campanulate, or salver-shaped—limb four-toothed. Stamens eight, inserted beneath a hypogynous disk, included or exserted; filaments free; anthers terminal or lateral, distinct or cohering at the base, unarmed, awned or crested, the cells bursting at the apex by a lateral foramen. Ocary four-celled, cells many-seeded; style filiform; stigma capitate, cup-shaped, or peltate. Capsule four-celled, bursting loculicidally into four valves, the valves bearing the septa on their middle; septa opposite alternate, or sometimes adnate to the angles of the central four-sided or four-winged placentiferous column. Seeds numerous, oval, reticulated.—(Endlicher Gen. Plant.)

ERICA DOTGLASIL.—Lady Douglas's Heath (Fig. 1).—Leaves four in a whorl, linear-obtuse, ciliate, shortly awned; flowers terminal subumbellate, pedicels with linear-acuminate bracts, the upper pair reaching the foliaceous calyx; corollas clammy, tube cylindrical, thirteen lines long, two lines in diameter; throat slightly contracted; limb six lines in diameter, with spreading ovate-obtuse segments; stamens included, the anthers

extended below into a short spur; style equalling the tube of the corolla, with a four-lobed stigma.

E. MARNOCKLANA, Turnbull M.S.—Mr. Marnock's Heath (Fig. 2).—Leaves four in a whorl, linear-acute, ciliate, and terminating in a long awn; flowers in terminal umbel-like heads, pedicels bracteate, the uppermost pair reaching the calyx; calyx segments linear-lanceolate awned; corolla smooth, very slightly clammy; tube twelve-lines long, ventricose below, narrowing upwards, suddenly contracted at the throat; limb four-lines in diameter, with spreading bluntly ovate segments; stamens enclosed, with spurred anthers; style somewhat exserted, with an obscurely four-lobed stigma.

E. SIMULATA. — Dissembling Heath (Fig. 3). — Leaves in whorls of four, linear-lanceolate obtuse erecto-patent; flowers terminal, usually in fours, the bracts of the pedicels slightly overlapping the calyx; corolla smooth, twelve lines long, the tube very slightly inflated below, contracted at the throat; segments of the limb short, roundish, recurved; stamens enclosed, anthers spurred; style equalling the corolla tube, stigma obscurely four-lobed.—M.

ESCRIPTION.—Very handsome dwarf slender greenhouse shrubs; evergreen. Their peculiarities, in addition to what is stated above, are as follows:—E. Douglasiæ has the leaves very distinctly whorled, erecto-patent, longer and more spreading and recurved towards the points of the flowering shoots, which only we have seen; they are furrowed beneath and fringed with short glandular hyaline ciliæ. The flowers grow, from eight to twelve together, at the ends of the shoots, the corollas, ealyx, bracts, and pedicels, all varnished and very elammy; the foliaceous calyx consists of four lanccolate segments overlapping below, and agglutinated for about a third of their length; the tube of the corolla is delicate pink, with eight faint red lines or ribs, the throat deeply stained with chocolate red outside, purplish rose within; the limb delicate flesh colour. In E. Marnockiana, the leaves are spreading and somewhat recurved, glabrous, finely ciliated, and drawn out into a long terminal awn: they are furrowed beneath, and grow on erect glandular-fringed footstalks. The flowers come in terminal heads, from four to eight together, the bracts linear-acuminate, the calyx lobes linear-lanceolate, awned, and tinged with reddish brown. The corollas are rich crimson red, smooth, but almost destitute of clamminess; the throat is black, the segments of the limb red in the centre, shading off to blush white at the margins. E. simulata has awnless blunt-pointed leaves, and terminal flowers growing in fours; the calvx brownish red, scabrous, and fringed with short-stalked glands; the corollas are of a clear delicate rose colour throughout.

HISTORY, &c.—The three beautiful Heaths here figured were obligingly sent to us, along with one or two others, in July 1850, by Mr. Turnbull, the gardener at Bothwell Castle, in Scotland, who is well known as a most successful raiser and cultivator of this charming tribe of plants. As varieties they possess considerable merit and distinctness, and we think they deserve to be brought into general cultivation. Respecting their origin and habits, Mr. Turnbull has communicated the following particulars: - E. Douglasiae was obtained from E. Aitoniana, crossed with E. retorta major; it is a free bloomer, of good habit, and the flowers remain long in perfection. It is named in compliment to Mr. Turnbull's noble and much respected employer, a liberal patroness of floriculture and botany. E. Marnockiana, which is named in compliment to the Curator of the Royal Botanic Society of London, is a seedling from E. Irbyana, crossed by E. Hartnelli; a free bloomer, of dwarf habit, continuing long in flower, and, as there is little or no glutinous secretion upon the surface of the corolla, excepting on the dark ring of the throat, the flowers never become disfigured by insects adhering to them. E. simulata was preduced from E. Aitoniana, crossed with E. cerinthoides; it is a free bloomer, but less compact in its growth than the preceding; its name is selected in allusion to its almost total dissemblance of its parentage. For culture see vol. i., p. 81.—M.

VOL. 111

#### GANSEL'S BERGAMOT PEAR.

By MR. J. TOWERS, C.M.H.S.

The tying-down system with fruit-trees" (I., 293—6). I have no desire to criticise. I only suggest that, to obviate any difficulty which a tyro in the art of pruning may encounter, Mr. Errington would obligate by explaining his precise application of the term collar as it occurred in p. 294. In the ordinary acceptation of the term, the collar is understood to mean that part of a stem where the ascending and descending trunk of a tree meet—the former to produce the branches, the latter the divisions and ramifications of the root. But that central point of union could not, in the present case, have been implied. Not, however, to trespass farther, I proceed to copy what is said in Lindley's Orchard and Kitchen Garden (p. 358):—"Gansel's Bergamot.—This most excellent Pear is a native of our own country, as appears by a letter from David Jebb, Esq., of Worcester, to John Williams, Esq., of Pitmaston, in 1818, in which he says—'The Gansel's Bergamot was obtained from a seed of the autumn Bergamot, by his uncle, Lieutenant-General Gansel, at his seat at Donneland Hill, near Colchester, about half a century ago, namely in 1768.' It is much too tender to bear as an open standard in any part of England, nor does it succeed as an espalier; it requires an east or a south-east wall, where it ripens perfectly."

The last remark is undoubtedly correct; the fruit so situated will, doubtless, come to complete maturity; but that the tree is a most shy setter appears to be equally unquestionable. can be induced, as I hope to prove by the following veracious narrative:—When I resided in Berkshire I frequently inspected the fine old garden of Shottesbrook Park, then, and I believe now, under the able management of Mr. Gillett. The walls of the main garden I should estimate at fully fourteen feet in height, and against one of them, which commanded a westerly aspect (I forget the exact point), there stood one of the very finest Gansel's Pears in the kingdom. I dare not mention the extent right and left of its horizontally-trained branches from one vast main trunk. Hundreds of persons of all ranks, who came from all parts to visit the beautiful locality, and to inspect the fine old church, with its noble Yew close to the garden-wall, could attest the truth of any fair description I might venture to give of this grand Pear-tree. But it had one defect, which, during the course of many years, rendered it perfectly, or all but, useless; it could not, by any effort of the gardener, be made to bear a crop of fruit. The spurs, however regulated or pruned, were barren, and had attained a vast size, amounting to a useless deformity. At length it occurred to Mr. Gillett to renew the tree, and this he did gradually, and with the caution of experienced wisdom. He began by cutting back very low, and, in some cases, by amputating a moderate number of the old bushy spurs. In due time, as spring advanced, new wood was developed close home to, or very near, the base of each spur at its emergence from a main branch. One such shoot was selected from a spur, so conveniently situated as to be trained horizontally, exactly between the old main horizontals. By a steady persistence in this mode of treatment, every old spur was obliterated, and its place supplied by a shoot, which produced in succession a series of young spurs and fruitful eyes, that blossomed, set their fruit, and brought it to maturity.

Now, let any competent judge of fruit-trees picture to his mind's eye such a tree as I have attempted to describe, with a large trunk, furnished on each side with about twelve main branches, which, as an approximation, we may suppose to extend fifty feet in length, all supporting a complete series of fruitful secondaries, so as to form, as it were, as many fresh trees. What a feeling of delight would he not experience! As a closing remark, I cannot but think that any one who has charge of a barren tree, whose renewal he would thus attempt to effect, might call in aid Mr. Errington's method of "tying-down" with good results, as thereby the fruit-buds might be developed on the new shoots at an earlier period.

## Sacred Butang .--- Balm Erre, Myrrh, Bdellinm.

T appears probable that the substances above enumerated—Balsam, Myrrh, and Bdellium—are dobtained from the species of Balsamodendron represented in the accompanying engravings; though it is proper to state, at the outset, that the subject is beset with difficulties, and the probability is that no certain conclusion can ever be arrived at from the indistinct notices which occur in the Sacred records. We shall, however, endeavour briefly to indicate the opinions at which biblical scholars have arrived.

First, of the Balm or Balsam. This, perhaps, bears two names in the original Hebrew, tzeri

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which is translated "balm" in our 'version, but which critics doubtfully admit; and basam translated "spices," but which is considered to refer properly to the balsam tree. All that we can infer from the passages, in which the latter word occurs, is:—1. That in the early period of the Jewish monarchy, the balsam tree was cultivated in Palestine: "I am come into my garden . . . I have gathered my myrrh with my spice (basan)" (Cant. v, 1); "My beloved is gone down into his garden to the beds of spices (basam)" (Cant. vi. 2). 2. That the trees were probably presented to King Solomon by the Queen of Sheba: "She gave the king . . . of spices (basam) great abundance; neither was there any such as the Queen of Sheba gave King Solomon" (2 Chron. ix, 9). 3. Balsam was not, however, unknown to the Israelites during their forty years' wanderings, if basam is thus correctly translated; for in the enumeration of the free-gifts to the tabernacle, we read: "the rulers brought... spice (basam)." (Exod. xxxv, 27, 28). This, however, might have been procured of travelling merchants, with whom doubtless they occasionally fell in. These passages are not sufficient to fix the identity of basam and the balsam tree. That basam does apply to the latter, is, however, inferred on good grounds, namely, the almost identity of basam, or bosem, or baal-shemen, the Hebrew word in question, with basham, the name applied to the balsam tree of Mecca (Balsam of Gilead), which is also, in the Arabian language, called abosham. One Arabic name of the tree, balesan, is no doubt the root whence the Greek balsamon, and the modern balsam are derived. The similarity of names in different languages, is often the only track along which the ancient substances can be traced; and in this case, the coincidence appears satisfactory.

That the balsam tree, or as it is sometimes called, Balm of Gilead,-a tree most highly esteemed by the ancients,-was cultivated in Judea, is matter of record. According to some accounts, there were two gardens in which it was reared, one in Gilead, the other near Jericho; but Josephus and other writers state, that it grew only in the plains of Jericho, where, however, two gardens were said to have existed. Josephus also expressly states, that these were stocked with plants presented to King Solomon by the Queen of Sheba. These gardens appear to have been in existence about the commencement of the Christian era; for Pompey (B.C. 65) and Vespasian (A.D. 79) are each said to have paraded a tree of the precious balm obtained in Judæa, in their triumphal progress through the "eternal city," after their conquests in that country. Indeed, so highly prized was the balsam, that during the war of Titus against the Jews, we are told that two fierce contests took place for the balsam orchards of Jericho, the last of which was to prevent the Jews from destroying the trees, lest



Balsamodendron gileadense,

they should fall into the hands of their enemics Not a root or branch is now to be found in Palestine.

The balsam tree (Balsamodendron gileadense) forms a small tree with ash-coloured bark, smooth at first, but becoming rough by age, and bearing spreading branches. The ultimate branches are short and thorn-like, with small, very short, abortive branchlets, which bear the leaves and flowers at their extremities; the former ternate or trifoliate, with obovate entire glabrous leaflets; the latter small and insignificant, solitary on short stalks, succeeded by pointed fleshy drupes, consisting of a viscid pulp enclosing a bony nut. It is supposed that B. gileadense, and B. Opobalsamum are varieties of one species, though the latter is described as having spiny branches, leaves of five to seven obovate entire shining leaflets, and flowers in pairs, or in threes, though rarely succeeded by more than one or two drupes. B. gileadense—formerly called Amyris gileadensis, and A. Opobalsamum is a native of Arabia and the opposite coast of Africa, and appears to be confined to those southern latitudes. Its wounded bark yields Opobalsamum (balsam of Mecca, or of Gilead), the highly fragrant gum resin,

which is as much esteemed by the Orientals of the present day as it was by the ancients. The fresh balsam is of moderate consistence, of a light yellow colour, the odour agreeable, the taste bitterish, aromatic, heating. Though formerly highly extolled, its medicinal qualities appear to have no importance beyond what is possessed by the finer turpentines; and its heating qualities render it very unfit for cases when inflammatory action exists.

Tzeri, translated "balm," in our version, has been alluded to as of doubtful meaning. No evidence has yet been adduced which serves to connect it with the balsam tree; and it is at least probable, that it has reference to some other tree, not recognized, which produces a balsamic secretion. Tzeri was probably a produce of Gilead, or of the northern parts of Syria; since it is included in the presents sent to the governor of Egypt, by Jacob: "Carry down the man a present; a little balm (tzeri)" &c. (Gen. xliii, 11); and also formed part of the merchandise of the Ishmaelites who bought Joseph; they "came from Gilead . . . bearing spicery and balm (tzeri) . . . going to carry it down to Egypt" (Gen. xxxvii, 25). That it was a natural production of Palestine seems the more probable, as among the merchandise in which "Judah and the land of Israel" traded with Tyre, balm (tzeri) is mentioned (Ezek. xxvii, 17); and that it possessed medicinal properties seems equally clear from the remaining well-known passages in which tzeri occurs: "Is there no balm in Gilead?" "Go up into Gilead, and take balm:" "Take balm for her pain, if so be she may be healed" (Jer. viii, 22; xlvi, 11; li. 8).

We come next to Myrrh, which is taken as the equivalent of the Hebrew mor, and the Arabic



Balsamodendron Myrrha.

mur. This substance is frequently mentioned in the Bible. Pure myrrh (mor-deror) was to be one of the ingredients of the "holy anointing oil" for the service of the tabernacle (Exod. xxx, 23); and this is the earliest notice of it that we possess. Myrrh-oil of myrrh-is next mentioned as employed in the purification of Esther and her companions, in the harem of the Persian king at Shushan (Esth. ii, 12). It is also referred to as a perfume: "All thy garments smell of myrrh, and aloes, and cassia" (Ps. xlv, 8); "My hands dropped . . with sweet-smelling myrrh" (Cant. v, 5): "His lips, like lilies, dropping sweet-smelling myrrh" (ver. 13)—which Luther translates "spontaneously profluent myrrh." In later times, we find myrrh mentioned among the gifts brought by the "wise men of the East" to the infant Jesus (Matt. ii, 11); and again it occurs, in the sacred narrative of the events of the crucifixion and entombment: "They gave him wine to drink, mingled with myrrh, but he received it not" (Mark xv, 23). Nicodemus "brought a mixture of myrrh and aloes," for the purpose of embalming the body (John xix,

This substance, celebrated among the ancients as a perfume and fumigator, burned in their temples, employed in embalming the bodies of

their dead, and esteemed for its medicinal qualities, is considered to be the resinous exudation of another species of Balsamodendron—B. Myrrha. Ancient authors mention Arabia, India, Abyssinia, Egypt, &c., as producing myrrh. Among the Egyptians, myrrh was called bal; and it is curious that, in the present day, throughout India, it is known by the name of bol. Ehrenberg found near Gison, on the borders of Arabia Felix, a small tree off which he collected pieces of myrrh, which, when analysed, were acknowledged to be genuine. This tree was the Balsamodendron Myrrha; and it is further interesting that specimens of what appears to be the same tree, have been brought from the confines of Abyssinia.

This Balsamodendron Myrrha, forms a low thorny ragged-looking tree, with smooth ashen grey bark, the ultimate branches short and thorny, bearing imperfectly ternate leaves composed of obovate

unequal leaflets. The flowers are not known, but the drupes are ovate acuminate, smooth, and somewhat larger than a pea. The myrrh exudes from cracks in the bark of the trunk, and is artificially obtained by bruising the latter with stones, which is principally done during the hot months. It is generally in pieces of irregular form and size, and is imported commonly of a reddish brown colour, the taste bitter and aromatic, the smell peculiar and balsamic. It is at first soft, oily, and yellowish white in colour; but, by exposure to the air, it hardens, and the colour changes. Its action is stomachic, excitant, stimulant and expectorant; and it forms an ingredient in many tooth powders. Very extravagant statements have been made as to its medicinal properties.

"Stacte" occurs once in the authorized version (Exod. xxx, 34), as a translation of *nataf*, and is mentioned as an ingredient of a compound perfume, to be made "after the art of the apothecary." Many conjectures have been offered as to what is here intended; but the most probable suggestions are those which consider it as the purest kind of myrrh, called *stacte* by the Greeks; or a species of Storax gum, which the Greeks also called *stacte*, which is described as transparent like a tear, and resembling myrrh. But there appear no means of identifying *nataf* with either of these substances.

In two passages, the Hebrew *lot* is in the authorized version, erroneously translated "myrrh" (Gen. xxxvii, 25; xl, 11), Gum ladanum appears to be intended.

Bdellium is the translation of bedolach, which occurs in Gen. ii, 12, and Numb. xi, 7; in the former as a product of the land of Havilah, and in the latter as being of the colour of the miraculously supplied manna on which the Israelites were fed. Different opinions have been held, in respect to its identification. By some it is translated pearl; others regard it as a precious stone; but the more probable interpretation seems to be that which refers it to the aromatic gum resin bdellium, which view is supported by Josephus's account of the manna, by the Vulgate, and by several ancient writers.

The term bdellium is, however, applied to two gum-resinous substances. One is called African bdellium and is the production of Balsamodendron africanum, formerly called Heudelotia africana; this was first

found on the west of Africa in Senegal, whence, as well as from Guinea, African bdellium is imported; the same species occurs in Abyssinia. The other, called Indian bdellium, or false myrrh, is probably the bdellium of the Bible, and is the produce of a tree growing in India, Persia, and Arabia. This bdellium has been supposed to be the produce of Amyris Commiphora, now called Balsamodendron Roxburghii; but a paper recently published by Dr. J. E. Stocks, in Hooker's Journal of Botany, seems to prove that it is procured from a species which has been named B. Mukul; and which Dr. Stocks found to grow throughout Seinde, and other parts of India, extending to Arabia, according to the observation of his friend, Dr. Carter, probably common up the Persian Gulf, and serving to connect the Indian and Syrian This tree yields the gum resin, googulthe mukul of the Persians and Arabians, which is believed to be the bdellium of the Bible. It is undoubtedly the genuine googul of the bazaars of Hydrabad and Kurrachee, and that which is exported from Bombay. Its general characteristic is bitterness; the best kind is clear, pure, viscous, sweet-smelling, yellow, and bitterish. When thrown on the fire, it emits an odour like the laurel [? Laurus],



Bals im dendron Mukul.

and readily dissolves in water. When old, its bitterness increases, and the older it is the darker it becomes. It is esteemed cordial and stimulant, and is extensively employed by the Hindoos as incense

in their temples, though its smell is by no means agreeable.

The Balsamodendron Mukul is a small tree, of four to six feet in height, or more generally a stunted bush, with thick knotty crooked branches, covered with ash-coloured bark, which peels off in flakes, leaving exposed the under bark, which separates in large rolls; the subterminal branches are short and spiniform, bearing leaves which are either simple obovate, and toothed towards the apex, or trifoliate, with the lateral leaflets sometimes minute and entire, but generally serrated, and half the size of the terminal leaflets. The leaves and flowers are collected at the end of short stanted buds,

which finally develope into spines, or become soft shoots; the flowers are diœcious, minute, and appear in little bundles at the end of the non-developed buds. The drupe is red when ripe, ovate, acuminate, enveloping the nut by a four-cleft pulp, whose arms meet at the apex. The gum resin is collected in the cold season, by making incisions with a knife in the tree, letting the resin fall on the ground: hence its dirty and impure state as found in the shops.

We conclude with Dr. Royle's remark:—"The whole of the species of this genus require to be carefully examined from good and authentic specimens, accompanied by their respective products," before the several doubts which obscure the matters we have been considering can be satisfactorily

resolved .-- M.

#### THE CHEMISTRY OF SOILS AND MANURES.

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INORGANIC MATTERS—POTASH, SODA, LIME, AND MAGNESIA.

ROM what has been already stated, it appears that the incombustible portion of the soil of England, on an average, amounts to no less than about 96 per cent. of its whole weight, when free from water. In good garden land it constitutes about 90 per cent. The general composition of the earthy and incombustible part of the soil has already been indicated; but though an acquaintance with the subject may furnish the gardener with valuable hints in choosing proper soil for the particular plants he wishes to grow, yet such general ideas are insufficient for a clear understanding of the doctrine of manures, and guiding the practical man in economical operations. We are therefore not satisfied with having mentioned the names of the earthy matters in the soil, but shall now proceed to examine a little more in detail their exact chemical nature, the state of combination in which they occur in the soil, their physical and chemical properties, and their probable functions in relation to vegetable life.

All fertile soils, besides organic matters, always contain a determinate quantity of ten or eleven different chemical substances. These, we have seen, are:—Potash, Soda, Lime, Magnesia, Alumina,

Iron, Manganese, Silica, Sulphur, Phosphorus, and Chlorine.

1. Potash.—When we burn the wood, smaller branches, or leaves of any of our indigenous trees, a whitish ash remains behind, amounting to 1—2 per cent. when wood has been used, whilst the smaller branches produce a larger quantity of ash, and the leaves as much as 6 or 7 per cent.; this ash, washed with water, and the washings evaporated in an iron pot, and calcined, furnish the commercial pot-ashes. From these pot-ashes pearl-ash is obtained by adding a small quantity of water, decanting the liquid from the insoluble impurities present in crude pot-ashes, and evaporating to dryness. Pearl-ash, which constitutes the residue, is an impure form of potash in combination with carbonic acid, or crude carbonate of potash. When a solution of carbonate of potash is boiled with newly-slaked quicklime, it is gradually deprived of carbonic acid, the latter entering into combination with the lime, and the carbonate of potash thus is converted into pure or caustic potash, as it is termed, on account of its effects on vegetable and animal substances.

Potash, which never occurs in nature in this caustic state, in the hands of the chemist can be separated into a silver-white soft metallic substance—potassium; and into a gaseous element—oxygen. Potash exists in considerable quantity in the ashes of all land plants—in some in larger, in others in smaller quantities. Many plants require, as a necessary article of food, a large amount of potash—for instance, the common Bracken (Pteris aquilina); and as the soil is the only source from which they are naturally supplied with potash, we are furnished at once with the explanation why this and other plants delight more in one soil than in another, and why the application of wood-ashes, which chiefly consist of carbonate of potash, promotes the healthy growth of Clover, Beans, Peas, Potatoes, and other plants whose ashes contain much potash.

Carbonate of potash, however, is not the form in which potash is generally met with in soils. Potash constitutes but a small proportion of the whole mass of the soil, amounting seldom to more than 1 per cent., and often to a mere fraction per cent., and is found here chiefly in combination with silica. Such combinations, or silicates of potash, form part of many minerals. Some kinds of felspar, mica, and granite contain a large proportion of silicate of potash, amounting often to 15—20 per cent., and silicate of potash, though in much smaller quantities, also enters into the composition of many trap rocks, basalts, and whinstones. On the gradual crumbling down of the solid rock, silicate of potash is set free, and rendered available to the plants. Clays—which, as we shall see hereafter, are principally derived from felspar—likewise invariably contain silicate of potash, and it is partly for this reason that light land, generally deficient in potash, is benefited much by claying.

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Nitrate of potash, or saltpetre—a combination of nitric acid with potash—is occasionally found in small quantities in richly-manured garden land, and occurs naturally in certain districts in India, where it is found so abundantly that the salt forms a white efflorescence on the surface of the soil.

2. Soda—Sea-weeds and plants growing near the sea-shore, on combustion, produce an ash, which contains much soda. The soda is as essential to sea-plants as potash is to land-plants.

Soda, like potash, is not a simple or elementary body, but a combination of a white metallic substance—sodium, with oxygen, and in many respects resembles potash. Pure or caustic soda is obtained in the same manner as caustic potash, from carbonate of soda—a combination of carbonic acid with soda, known to most persons under the more familiar name of common washing soda. Carbonate of soda occurs in the soil in many warm climates (Egypt, India, South America, &c.), in so large quantities that it is technically prepared in these places by washing the soil with water, and evaporating the washings until the soda begins to separate in crystals. In our own land, carbonate of soda is rarely found in any large quantity naturally, and its presence in the soil often may be traced to the water with which the land, naturally or artificially, is irrigated. Deep well-waters in limestone districts usually contain carbonate of soda, which therefore would appear to exist in many limestones. I have myself found traces of carbonate of soda in the soil of the College farm, as well as in all the oölitic rocks of the neighbourhood, and in the pump-water of Cirencester.

By far the most common form in which soda occurs in soils is as common salt. Chloride of sodium, common or sea-salt—a combination of chlorine-gas with sodium—may easily be detected in all soils of England, and prevails particularly in localities which are known to have once been the beds of ancient seas, or in lands which are much exposed to sea-breezes. With the spray common salt is often carried by the wind to very considerable distances inland, and it is perhaps the neighbourhood of the sea which explains why common salt does not produce the same striking effects on vegetation in this country which we observe to follow the application of sea-salt on the Continent. All maritime plants require much common salt as a necessary element, without which they must perish; and we safely infer therefrom, from the occurrence in inland localities of the Sea-pink (Armeria maritima), the Sea-plantain (Plantago maritima), the Salt-wort (Glaux maritima), the Sea-sandwort (Arenaria marina), and other plants which delight to grow by the sea-side, that the soil in these places always contains much common salt. In good garden land, and in fields near towns, common salt is generally found in larger proportions than in soils remote from the sea-shore.

Nitrate of soda, or Chili, or cubical saltpetre, is a salt consisting of nitric acid and soda, which is imported largely into this country, chiefly from Chili and Peru. It is used extensively for technical and agricultural purposes. In Chili and Peru it occurs native, forming frequently extensive beds. In our own country, nitrate of soda is found now and then in richly manured land, and appears to exercise a most marked effect on grass land. Even a very small dose of nitrate of soda applied to pasture or artificial meadows causes the more luxuriant growth of the herbage, and gives a peculiar rich darker green appearance to the meadows thus treated.

Sulphate of soda, or Glauber salt, which is found in many mineral springs, is occasionally met with in soils; but, on the whole, it is not a constant element of all soils.

Silicates of soda combinations of silica with soda—in every respect resemble their corresponding potash salts. Silicate of soda, in small quantities, is found in most soils.

3. Lime.—Chalk, marble, limestone, are the names of some varieties of carbonate of lime. These minerals are, more or less, pure forms of carbonate of lime, and are found in nature often in enormous masses, spreading over hundreds of acres. Exposed to the heat of a lime-kiln, the carbonic acid is driven out by the intense heat, and pure or caustic lime remains in the kiln. Caustic lime, prepared from white marble, the purest form of carbonate of lime, is a perfectly white substance, which is composed of the metal calcium, and oxygen gas.

In its effects on vegetable and animal matters, caustic lime resembles caustic potash and soda; but it is much slower in its action. Caustic or quick lime, on account of these effects, is therefore used with much benefit on peaty land. The excess of organic matter, which acts injuriously on vegetation, is thereby gradually destroyed or converted into really nutritious food for plants. Quick lime, sprinkled with water, absorbs the same with evolution of much heat, and falls to powder, or becomes slaked. Slaked lime, a white powder, though perfectly dry to all appearance, contains much water in an invisible form; the water is chemically combined with lime, and this compound, in every day life, called slaked, is termed by the chemist—lime-hydrate. If slaked lime is exposed to air, it attracts carbonic acid from the atmosphere, and becomes partially changed into mild, or carbonate of, lime. Caustic lime is slightly soluble in water, which thereby is rendered alkaline. Lime-water is a solution of lime in water. Carbonate of lime, on the contrary, is scarcely soluble in perfectly pure water; but

in water containing carbonic acid in solution, carbonate of lime dissolves to a considerable extent. Spring-waters generally contain free carbonic acid in solution; and as almost all soils, and many rocks, in which springs find their origin, contain lime, spring-waters frequently contain this element in solution. When such waters are boiled for some time, they become muddy; the volatile carbonic acid of the water is expelled, and the lime, now deprived of its solvents, is deposited gradually from the muddy water, and constitutes, along with some gypsum, likewise deposited under these circumstances, the greater part of the incrustations in tea-kettles and boilers.

Salts of lime are found in all ashes of plants. Soils capable of sustaining vegetable life, therefore, must contain lime in some form or other. Generally, carbonate of lime is the combination which occurs most frequently in soils; but the silicate, phosphate, nitrate, and sulphate of lime are found in many soils. The relative proportions of lime in soils varies much. While some soils contain as much as 20 or even 30 per cent of lime; others contain only 2 or 3 per cent. On the whole, lime-salts are found in much larger quantities in soils than potash-salts or soda-salts.

Sulphate of Lime, or Gypsum, or Plaster of Paris, is a well-known, white, often crystallized compound of sulphuric acid and lime, which occurs in many localities in England, forming occasionally mineral deposits of considerable extent. Gypsum frequently accompanies rock-salt, and is found likewise in sea-water, in many soils, and in springs which percolate through such soils, or which ascend from beds in which gypsum exists. Gypsum is slightly soluble in water; 500 parts of water being required for dissolving 1 part of gypsum. Crystallized, native, or commercial gypsum, contains about 21 per cent. of water, which may be expelled at a temperature a little above 300° Fahrenheit. Burned or anhydrous gypsum possesses the property of uniting again with the water which it lost by heating; and this takes place so readily, that a thin paste made of burned gypsum and water in a few minutes sets or hardens into a solid mass. On this property depends the application of burned gypsum for plaster casts and ornamental purposes. Many ashes of plants contain an appreciable quantity of gypsum; for instance, the ashes of peas, beans, lentils, and other leguminous plants: these are the plants which derive most benefit from gypsum.

Nitrate of Lime is a white, deliquescent salt, which occurs almost always in cultivated calcareous soils. When animal and vegetable substances, containing nitrogen, are mixed with quick lime, and allowed to putrify, nitrate of lime is constantly formed; hence its presence in compost heaps, made by the addition of quick lime to animal and vegetable refuse matters, and in highly manured soils, abounding in lime.

Phosphate of Lime, the combination of phosphoric acid with lime, which occurs in mineral veins in Cornwall and Cumberland, under the name of Apatite, is a hard mineral. A variety of phosphate of lime, called phosphorite, is found in large quantities in the province of Estremadura in Spain; but, generally speaking, in most cultivated soils of England phosphate of lime rarely exists, unless it be incorporated with the soil purposely in the shape of farm-yard manure, bones, coprolites, or other artificial manures.

4. Magnesia.—Pure or caustic Magnesia, which is sold in the shops as calcined magnesia, is a compound of magnesium with oxygen, and is usually obtained by calcining the white or carbonate of magnesia. Like quick lime, caustic magnesia is slightly soluble in water; while carbonate of magnesia is insoluble in that medium. Carbonate of magnesia, which in some places occurs native in a pure state, is commonly associated in nature with carbonate of lime. The magnesian limestones, which are such natural compounds of carbonates of lime and magnesia, contain from 30 to 40 per cent of carbonate of magnesia. It is in this form, and in all dolomitic rocks, or dolomites, that carbonate of magnesia is found in large quantities in nature. Existing as it does in many solid rocks, magnesia is never wanting in fertile soils, and it is found likewise in the ashes of plants. Soils containing much carbonate of magnesia, absorb moisture from the atmosphere with great avidity, and it is perhaps on this account that such soils are rendered cold.

Silicate of Magnesia enters into the composition of many minerals, which are distinguished by appearing soapy or greasy to the touch. Serpentine rocks, meerschaum, asbestos, soap-stone, are examples of minerals containing a large proportion of silicate of magnesia. Limestone also frequently contains the same compound.

The compounds of sulphuric acid and muriatic acid with magnesia, are found in many mineral waters; the latter more particularly in sea-water. The former, sulphate of magnesia, exists in large quantities in several salt-springs near Epsom; hence the derivation of the familiar name of Epsom salts, given to sulphate of magnesia. This salt exists almost in all soils which are formed from the decomposition of dolomitic rocks; and its presence sometimes is indicated by the white efflorescence which, in warm and dry weather, appears on the surface of soils, in which sulphate of magnesia abounds.

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### THE GENERA AND SPECIES OF CULTIVATED FERNS.

BY MR. J. HOULSTON, ROYAL BOTANIC GARDEN, KEW; AND MR. T. MOORE, F.B.S.

It is the intention of the series of papers of which the present is the commencement, to enumerate and describe, in a popular form, all the Ferns which have been known in cultivation in this country; and, at the same time, by means of ample generic definitions, accompanied by wood-cuts, to afford some insight into the modern classification of the most elegant family of the vegetable kingdom.

Sub-order-Polypodiace.e: Tribe-Polypodieæ.

SECT. I.—Orthophlebieæ, J. Smith.—From orthos, straight, and phleps, a vein ; the veins being either simple, or forked, but not forming a network.

RAMMITIS, Swartz.—Name derived from gramme, lettering; alluding to the sori.

Fronds simple, linear, with entire or serrulate margins, plane or concave at the apex. Sori oval, oblong oblique; spore-cases lateral. Veins simple or forked, internal; the soriferous venule sometimes very short.—This genus, from its linear-oblique naked sori, has considerable affinity with Leptogramma, but is easily distinguished by its dwarf habit, elongated sori, and free venation. There are many known species, but one only has hitherto been introduced in a living state. Fig. 1 represents the upper portion of a frond of G. australis (nat. size).

1. G. australis, R. Brown.—A very interesting evergreen greenhouse species; native of New Holland. Fronds terminal, adherent to a tufted rhizome, from four to six inches long, simple, linear-acuminate, attenuate. at the base, with linear-oblique sori, confined to the upper portion of the frond, occupying the whole of the venule. Stipes hairy.

OLYPODIUM, Linneus. — Name derived from polys, many, and pous, a foot; the creeping rhizome having many foot-like divisions or tubercules, like those on the feelers of polypes.

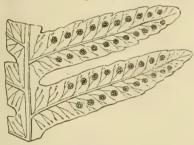


Fig. 2.

Sori circular, rarely oval or oblong, naked, transverse, uniserial solitary or irregular; spore-case terminal or lateral, sometimes scated in a deep cyst or cavity forming elevated protuberances on the upper surface of the fronds. Veins simple, forked or pinnate, from a few inches to four or

surface of the fronds. Veins simple, forked or pinnate, free. Fronds varying from a few inches to four or fig. 1. five feet high; from simple to pinnate, and decompound; multifid, coriaceous, membranous, glabrous, villose or glandulose. — Before this genus was divested of the species possessing a reticulated venation, it contained between 200 and 300 species which were widely different in habit, texture and circumscription of frond, and are at present distributed among nine genera. The true Polypodiums have naked circular (rarely oblong) sori, with simple forked

or pinnate free veins. Fig. 2 represents a portion of P. vulgare (nat. size).

1. P. vulgare, Linnæus.—A hardy, ornamental, evergreen, indigenous Fern,\* common in Europe, Asia, and North America. Fronds one foot high, dark green, lateral, articulated on a creeping scaly rhizome; pinnatifid, the segments lanceolate, obtuse, with a crenulate or serrulate margin. Sori confined to the upper portion of the frond, arranged in a single row on each side of the midrib of the lobes (uniserial); spore-cases attached to the apex of an excurrent venule (terminal); apices of veins club-shaped.

Several forms of the common Polypodium are found with the segments more or less pinnatifid, lobed, crenate, serrate, or bifid at the apex; but two or more may often be detected growing on the same plant. The only form that appears to maintain its distinct character is P. cambricum, Linneus, the segments of which are deeply and interruptedly pinnatifid. It is very elegant, but usually without fructification.

2. P. planula, Humboldt.—An exceedingly beautiful evergreen, stove species, from the West Indies and South America. Fronds six to ten inches long, delicate green, the stipes and rachis black, lateral, articulated on a creeping rhizome; lanceolate, sub-pinnate, with numerous linear, parallel, horizontal, pinnæ. Sori uniserial, on the upper portion of the frond.

3. P. pectinatum, Linnæus.—A very beautiful, evergreen, stove Fern; native of the West Indies. Fronds from one to one and a half feet long, pubescent, lateral, articulated on a creeping rhizome; sub-pinnate, the pinnæ linear, parallel, horizontal. Stipes and rachis black. Sori uniserial, of a bright yellowish-brown, occupying the whole under surface.

4. P. Paradiscæ, Langsdorf and Fischer.—A very handsome, evergreen, stove species; from Brazil and the West Indies. Fronds pubescent, from two to five feet long, very slender, the stipes and rachis blackish-brown; they are lateral, articulated on a creeping rhizome; lanceolate-clongate, sub-pinnate, the segments linear, nearly horizontal, narrowing to the base. Stipes very short. Sori uniserial, terminal, occupying nearly the whole frond. Cultivated in gardens under the name of P. otiles.

For more ample descriptions and figures of the British species, see Handbook of Rritish Ferns. London: Groombridge, vol. 111.

5. P. Phegopteris, Linnaus.—A deciduous, hardy, indigenous species, found in most European countries, as far north as Lapland. Fronds from six to twelve inches long, lateral, adherent to a somewhat scaly creeping rhizome; bipinnatifid, the lower pinna standing forward, deflexed, with linear-lanceolate, entire segments, the lower ones adnate-decurrent. Sori rather oblong, intramarginal.

6. P. hexagonopterum, Michaux.—A very handsome, hardy, deciduous Fern; from North America. Fronds triangular, about one and a half foot long, rather hairy, lateral, adherent to a creeping rhizome; bipinnatifid, pinnæ opposite, sessile, decurrent at the base, with oblong-obtuse crenulate segments. Sori submarginal.

7. P. subpetiolatum, Hooker.—A pale-coloured, evergreen, greenhouse Fern; from Mexico. Fronds one to three feet long, pubescent, lateral, articulated, on a scaly, creeping rhizome; linear-lanceolate, pinnate, the pinnae entire but without a footsalk. Sori uniserial; nearly all the fronds soriferous throughout.

8. P. Henchmanii, J. Smith MS.—A glabrous, evergreen, stove Fern; from Mexico. Fronds two feet long, quite smooth, pinnate, with long, linear-lanceolate, narrow pinnæ, decurrent at the base, very dark green, lateral, articulated on a scaly creeping rhizome. Sori large, uniserial, bright brown. This plant has been in cultivation for several years, but unnamed.

9. P. alpestre, Sprengel.—An ornamental, hardy, deciduous Fern; native of Switzerland. Fronds one and a half foot long, glabrous, terminal, adherent to a short, creeping rhizome; lanceolate, bipinnate, with lanceolate-acuminate pinnæ, narrowing towards the base, the pinnules distant, pinnatifid, oblong. Sori medial, round and uniserial.

10. P. Dryopteris, Linnæus.—A deciduous, hardy, British species; also found throughout Europe, Northern Asia, Africa, and N. America. Fronds six to ten inches high, lateral, adherent to a creeping rhizome; ternate, smooth, bipinnate with deflexed spreading divisions, and obtuse, subcrenated segments. Sori rather oblong, intramarginal.

11. P. calcareum, Smith.—A hardy, deciduous British Fern; found in most parts of Europe and North America. Fronds from six to twelve inches high, erect and rather rigid, lateral, adherent to a rough scaly creeping rhizome; triangular, three-branched, the branches doubly pinnate, with somewhat crenated obtuse segments. Sori round, intramarginal; veins simple, occasionally forked.

12. P. trichodes, Reinwardt.—An ornamental, evergreen, stove species; from the East Indies. Fronds three to five feet high, hairy, terminal, adherent to a thick, creeping rhizome; bi-tripinnate, fragile, pale green, with linear-lanceolate pinnæ, the pinnules pinnatifid, with somewhat ovate, bluntly lobed segments. Sori round, medial. Stipes and rachis covered with a fine powder; stipes scaly, especially near the rhizome. This Fern is in cultivation under the name of Lastrea paludosa.

13. P. effusum, Swartz.—An evergreen, stove Fern; from Jamaica. Fronds membranous, three to five feet long, glabrous, pale green, adherent to a creeping rhizome; deltoid, four times pinnate, with lanceolate pinnæ, the pinnules linear-lanceolate, with pinnatifid segments, the lower ones distant. Sori round, medial; veins pinnately forked. Stipes scaly, especially near the base.

14. P. lachnopodium, J. Smith.—A very ornamental stove species, of a soft delicate texture; from Jamaica. The fronds are from two to four feet long, terminal, adherent, forming an erect (caudiciform) rhizome; deltoid, bi-tripinnatifid, with lanceolate-acuminate pinnules, and oblong-linear, obtuse, hairy segments. Sori round, medial. Stipes and rachis densely covered with narrow brown scales.

TYPOLEPIS Bernhardi.—Name derived from hypo, under, and lepis, a scale; in allusion to the sori being partly concealed by a scale-like indusium.



Fig. 3.

Sori round, terminal, marginal, partly concealed by an indusiform reflexed crenule, and situated opposite the sinus of the segments, forming a row on each side the ultimate rib. Veins forked or pinnate; venules direct, free, the lower exterior one sporangiferous. Fronds from two to six feet high, bi-tripinnate, segments smooth, crenulated or covered with glandulous hairs.—This genus is usually placed in Pterideæ, owing to the reflexed marginal crenule being taken for an indusium; but, from repeated observations of its affinities, it is now arranged in Polypodieæ, the reflexed marginal crenule being considered analogous to what occurs in Struthiopteris, and Allosorus; it hence forms a connecting link between Struthiopteris and Polypodium. It is difficult to conceive that any other station could be correctly assigned for it, for in one species the crenule is scarcely reflexed, and this having also forked veins and medial sori, seems scarcely divisible from Polypodium. Fig. 3 represents a pinnule of *H. repens* (nat. size).

1. H. rugulosa, J. Smith (Polypodium rugulosum, Labillardiere).—A rambling growing, evergreen, greenhouse species, distributed more or less throughout the East and West Indies. The plant now in cultivation comes from New Holland. Fronds from two to four feet high, lateral, adherent to a very peculiar, elongated, rough, creeping rhizome; tripinnate, pinnæ lanceolate, with lanceolate-acuminate pinnules, and oblong, rather obtuse segments, the lower ones distant and pinnatifid, margin slightly crenulated. Sori round, medial. Fronds covered with glandulous hairs.

2. H. repens, Prest (Lonchitis repens, Linnaus; Cheilanthes repens, Kaulfuss).-A large, coarse-growing,

evergreen, stove Fern; native of the West Indies. Fronds from three to six feet high, covered with glandulous hairs; lateral, adherent to a croeping rhizome; decompound, three to four times pinnate, pinnules lanceolateacuminate, with oblong-linear, rather obtuse pinnatifid segments, which are somewhat convex, the lower pair distant; margin crenulate. Sori round, terminal, and partly concealed by a reflexed marginal crenule.

H. repens β. difforme has a peculiar rugose appearance, being somewhat curled, which character is constant under cultivation: it is not, however, a very interesting form, but singular. Fronds evergreen, two feet high, tripinnate, with irregular pinnæ, and lacerated pinnules. Sori round, and very few.

TRUTHIOPTERIS, Willdenow .- Name derived from struthios, an ostrich, and pteris, a fern; in allusion to the resemblance of the fronds to Ostrich feathers.

Fronds of two kinds: the fertile with contracted, revolute margins, forming, as it were, an universal indusium;

pinnæ linear, revolute, moniliform, each segment producing five soriferous veins, the margin becoming replicate and lacerated, and wholly occupied by round confluent sori. Spore-cases lateral; base of the pedicels concrete, forming an elevated, thickened receptacle. Veins pinnate, free.—The habit of this genus separates it from Polypodium, more than any technical distinction. Fig. 4 represents a pinnule of the sterile, and a portion of the fertile, frond of S. pennsylvanica (nat. size).

1. S. germanica, Willdenow.—A hardy, deciduous, ornamental Fern; from the south of Europe. Sterile fronds arranged in a circle on the outside of the plant, reclining, from two to three feet long, pinnate, with pinnatifid-acuminate pinnæ. Fertile fronds few, occupying the centre, erect, about a foot long, dark brown and resembling a bunch of feathers; terminal, adherent to an erect (caudiciform) rhizome; they are contracted, pinnate, the pinnæ crowded, linear, revolute, and moniliform. Sori round, confluent.

2. S. pennsylvanica, Willdenow.-A hardy, deciduous, ornamental species; from North America. The sterile fronds commonly attain the height of two feet, and are pinnate, the pinnæ acuminate, pinnatifid, with rounded blunt segments. The fertile ones are about a foot long, contracted, pinnate, with linear, crowded pinnæ, which are revolute and moniliform. Sori round, confluent. Rhizome erect; fronds adherent.

LLOSORUS, Bernhardi.-Name derived from allos, various; and LLOSORUS, Bernnarus.—Name deliver appearances presented by soros, a heap; in allusion to the altered appearances presented by the sori during the different stages of their development.

Sori round or oblong, becoming confluent and ultimately occupying

the whole under surface of the frond; spore-cases attached on or

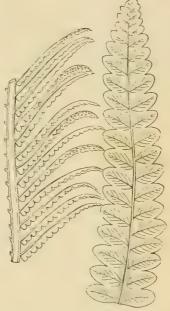


transverse sori, concealed by the revolute margin of the pinnules. Veins forked, free, elevated, terminating within the indusiform margin. Fronds of two kinds: sterile-bi-tripinnate, generally smooth, with pinnules dentate, crenate, or laciniate: fertile-contracted, segments oval or oblong, elliptical, revolute and plaited. Rhizome creeping, somewhat exspitose. Fig. 5 represents the upper portion of a sterile frond; the upper portion of a fertile frond (nat. size); and a segment of fertile frond (magnified) showing the position of the veins and sori, of

1. A. crispus, Bernhardi (Pteris crispa, Linnous; Cryptogramma erispa, R. Brown). - Sterile frond bipinnate, pinnules bi-tripinnatifid, segments oblong, often bi-dentate. Fertile frond contracted, bipinnate, tripingute below, pinnules linear-oblong, rather obtuse, revolute, entire, narrow at the base. Sori round intramarginal, subsequently confluent, concealed by the revolute margin of the frond. Veins simple, forked where they are soriferous. Fronds from three to six inches high, adherent to a short creeping rhizome. Only a single species of this genus is at present in cultivation; it is a very elegant Fern, of dwarf habit, found in rocky or stony places and on old walls in Britain; and is one of the more interesting of the small-growing species.

There are two or three distinct-looking forms of this plant occasionally met with; but they are not sufficiently constant to be considered

as permanent varieties, either in a botanical or cultural point of view.









OTHOCHLENA, R. Brown.—Name derived from nothos, spurious, and chlaina, a cloak; in allusion to some of the species appearing to have an involuere. Sometimes written Notholæna.



Sori round, solitary, subsequently confluent; spore-cases terminal, attached on or near the apex of the venules, forming a linear, continuous or interupted, marginal line. Veins forked, free, pinnate or bifurcate. Fronds varying from pinnate to bi-tripinnate, hairy densely scaly woolly or covered with a farinose powder, through which the spore-cases protrude, and which are usually but few to each sorus. Margin of fronds sometimes slightly reflexed.—The plants arranged under this genus are all very elegant, of dwarf habit, and generally difficult to cultivate, owing to the woolly or scaly surface of the fronds, which retains moisture; when once they become wet the water does not readily escape, and the fronds in consequence are often destroyed. It is therefore not advisable to sprinkle water on the fronds, but to keep them quite dry during winter. Fig. 6 represents a portion of the frond of N. trichomanoides (nat. size).

1. N. tenera, Gillies MS.—A very tender, delicate, evergreen, stove fern; from Chili.

1. N. tenera, Gillies MS.—A very tender, delicate, evergreen, stove fern; from Chili. Fronds bluish-green with shining stipes, six to eight inches high, adherent to a short creeping rhizome; glabrous, bipinnate, pinnules on the lower pinnæ cordate-ovate oblong-obtuse, superior ones becoming sessile, terminal one lobed. Sori terminal linear, continuous, confluent, forming a broad marginal band.

2. N. nivea, Desvaux.—A very tender, delicate, beautiful, evergreen, stove species; native of Mexico, Peru, and Chili. Fronds from six to twelve inches high, and covered beneath with white farinose powder, the upper surface bluish green; terminal, adherent to a short creeping rhizome; bipinnate, with roundish ovate, obtuse, entire pinnules, cordate at the base, the terminal one lobed. Sori terminal, linear, confluent, forming a broad marginal band.

3. N. argentea, Hort.—This is one of the handsomest of the whole genus. An evergreen stove species; a native of South America. Fronds triangularly ovate, about six inches long, and covered throughout with a white farinose powder; sub-bipinnate, with oblong obtuse crenate pinnules, the lower ones distant. Stipes, rachis, and midrib of pinnæ shining black. Sori linear, terminal, consisting of a single row of spore-cases, round, near the margin of each segment. Stipes scaly near the base. Fronds adherent to a somewhat creeping rhizome.

4. N. trichomanoides, R. Brown (Pteris trichomanoides, Linnaus).—A very handsome evergreen stove Fern; from Jamaica. Fronds slender, pendulous, one foot long, covered mostly beneath with a white farinose powder, and brown stellate pubescence; pinnate, pinnæ oblong obtuse, bluntly lobed or crenate, cordate and auriculate at the base. Sori terminal, confluent, forming a linear continuous marginal band.

5. N. crassifolia, Hort.—An ornamental evergreen stove Fern; native of South America. Fronds one foot long, densely covered beneath with imbricated fringed white scales, which ultimately become brown; upper surface scattered over with stellate pubescence; pinnate, pinnæ entire stalked, oblong-ovate, and cordate at the base. Sori terminal linear, protruding through the scales, and forming a continuous broad black border. Rhizome white, scaly, and creeping.

6. N. rufa, Presl.—An evergreen stove species; native of the West Indies and South America. It is a slender and rather straggling growing Fern. Fronds narrów, from twelve to eighteen inches long, woolly, adherent to a creeping rhizome; pinnate, pinnæ ovate, oblong-obtuse pinnatifid, with the stipes and rachis light brown. Sori terminal marginal, forming a linear continuous row of little more than single spore-cases.

7. N. sinuata, Kaulfuss.—A very elegant evergreen stove Fern; native of Peru, Mexico, &c. Fronds one to two feet long, reclining, linear pinnate, pinnæ cordato-ovate, obtuse, pinnatifid, white on the upper surface, and densely covered with imbricated fringed scales, upper surface bright green, scattered over with stellate

pubescence. Stipes, rachis, and rhizome scaly. Sori terminal, marginal, consisting of a few spore-cases, situated in the sinus of each segment, protruding through the scales.

8. N. squamata, Hort.—A dwarf evergreen stove Fern; from Mexico and Peru. Fronds pinnate, about six inches long, rather ovate, scaly beneath, with oblong-obtuse, pinnatifid pinnæ, dark green above and whitish beneath. Sori terminal, continued round each segment of the pinnæ. This species is but little known in cultivation, although introduced about 1842.

9. N. lanuginosa, Desvaux.—A very tender, delicate, evergreen, greenhouse Fern; native of the South of Europe, Madeira, &c. Fronds four to six inches high, very woolly and brownish on the under surface; linear-lanceolate, bipinnate, with roundish ovate obtuse pinnules, the terminal one lobed. Sori, round, terminal, subsequently confluent. Rhizome, short, somewhat creeping.

10. N. vestita, J. Smith (Cheilanthes vestita, Swartz).—A low, delicate, slender, evergreen, frame, or greenhouse species; native of various parts of North America. Fronds from five to ten inches long, densely covered with hairs, and adherent to a short creeping rhizome; linear, bipinnate, with roundish ovate pinnæ, the pinnules pinnatifid; margin crenate. Sori, round, terminal, marginal, subsequently confluent. This species is often sold for our indigenous Woodsia ilvensis.

11. N. distans, R. Brown.—A small evergreen greenhouse Fern; from New Holland. Fronds six to ten

N. distans, R. Brown.—A small everg

inches long, adherent to a creeping rhizome; linear-lanceolate bipinnate, pinnules oblong obtuse, opposite, sessile and hairy. Sori, terminal, marginal, confluent. Stipes, rachis, and midrib of pinnæ, covered with scales.

12. N. Maranta, R. Brown.—A rather handsome evergreen Fern; found in the South of Europe and Madeira. Fronds from six to ten inches high, rather stiff, densely covered with scales on the under surface, and adherent to a thick, short, creeping rhizome; ovate-lanceolate, bipinnate, with oblong obtuse pinnules, the lower one stalked, superior ones sessile, entire at the apex. Sori terminal, and marginal.

13. N. tomentosa, Desvaux.—A woolly evergreen stove species; from Mexico. Fronds very handsome, about a foot long, tripinnate, with oblong-linear pinnules, and very small segments, which are roundish ovate distant and concave, the terminal one large. Sori consisting of a few spore-cases on each segment. Rhizome

14. N. Eckloniana, Kunze.—This evergreen stove Fern is the most beautiful one of the scaly section, and is a native of the Cape of Good Hope. Fronds nearly a foot long, covered on all parts with narrow white scales, giving them a woolly appearance; rather ovate, tripinnate, with oblong-obtuse pinnules, small roundish ovate segments, crenate and concave, the margin revolute, lower ones distant, superior ones sessile. Sori terminal, consisting of a single row of spore-cases on each segment, partly concealed by the revolute margin. Rhizome creeping.

N. lendigera of some authors is referred to Cheilanthes (Pteridex).

MYMNOGRAMMA, Desvaux.—Name derived from gymnos, naked, and gramma writing; in allusion to the linear sori being destitute of a cover.

Sori linear, forked oblique, subsequently confluent; spore-cases medial superficial, usually occupying nearly the whole length of the venules. Veins forked, free. Frond varying from a

few inches to three or four feet long, simple pinnate bipinnate or decompound, smooth hairy or covered beneath with a rich-coloured farinose powder. Fig. 7

represents a pinna of G. tomentosa (med. size).

1. G. rufa, Desvaux (Hemionitis rufa, Swartz).—An ornamental, evergreen, stove species; native of tropical America. Fronds from one to two feet long, hairy, pinnate with oblong, obtuse pinnæ, stalked, and cordate at the base, terminal, adherent to a fasciculate erect rhizome. Stipes and rachis, reddish brown. Sori linear medial, forked, oblique, subsequently confluent, on every pinnæ throughout the frond.

2. G. tomentosa, Desvaux.—This is a tender, delicate, and beautiful stove Fern; native of Brazil and the West Indies. Fronds bipinnate, hairy and membranous, from one to two feet long, with oblong-obtuse pinnules, the lower ones cordate at the base, terminal one lobed, acuminate. Sori linear, medial, forked oblique. Stipes and rachis black, terminal, adherent to a fasiculate erect rhizome.

3. G. Calomelanos, Kaulfuss.—An ornamental evergreen stove Fern; from Jamaica. Fronds from two to three feet long, covered beneath with a white farinose powder, upper side dull green, bi-subtripinnate with lanceolate-acuminate pinnules, and elongated acuminate lobed segments. Sori forked, medial, oblique, confluent, and nearly covering each segment. Stipes rachis and midrib of pinnæ black, terminal, adherent to a fasciculate erect rhizome. This plant frequently goes under the name of G. peruviana, in cultivation.

4. G. tartarea, Desvaux.—An ornamental evergreen stove species; from the warm parts of America. Fronds from two to three feet long, covered beneath with a white farinose powder, the upper surface dull green; bi-subtripinnate with lanceolate-acuminate pinnules, and roundish ovate or oblong segments, which are distant, the lower ones lobed. Sori linear medial, forked oblique, becoming confluent. Stipes rachis and midrib of pinna black, terminal, adherent to a fasciculate erect rhizome.

5. G. chrysophylla, Kaulfuss. -One of the most beautiful of all exotics in cultivation; an evergreen stove species, from the West Indies and South America. Fronds from one to two feet long, covered beneath with a farinose powder of the richest golden yellow, the upper surface yellowish green, bipinnate with lanceolate-acuminate pinnæ, and roundish ovate or oblong pinnules, slightly dentate, distant and pinnatifid, with medial sori scattered on the veins, terminal, adherent to a fasciculate erect rhizome. This Fern, like most others, varies in cultivation according to the treatment it receives; if subjected to a low temperature, and a rather dry atmosphere, the fronds do not exceed ten inches high, are nearly triangular and of the most intense golden yellow; but if in a temperature of 85-90' Fahrenheit, with proportionate moisture, it then becomes more compound, two feet high or more, the segments of the pinnules more serrated, and of an exceedingly bright yellow

6. G. ochracea, Presl?—An evergreen stove Fern; from Peru. Fronds from one to one and a half foot long, pale yellow beneath, the upper surface bright green, terminal, adherent to a tufted rhizome; bipinnate with lanceolate-acuminate pinnæ, and narrow oblong-linear dentate pinnules. Sori medial, somewhat scattered on the veins. This has the most compact frond of the yellow powdery kinds, and is shining on the upper surface.

Known in cultivation under the name of G. Massoni.

7. G. Mertensii, Hort.—An elegant evergreen stove Fern; from South America. Fronds delicate, very fragile, one and a half feet long, covered beneath with a rich yellow farinose powder, the upper surface yellowish green; bipinnate with lanceolate pinnæ, and roundish or elongated pinnatifid pinnules, with dentate segments. Sori medial, confluent, covering nearly every segment of the frond. Rhizome tufted.

8. G. sulphurea, Desvaux.—A very elegant dwarf evergreen species; from Jamaica. Fronds from six to ten inches long, fragile, and very delicate, the under surface covered with a farinose powder of a bright sulphur yellow, upper surface pale green, terminal, adherent to a fasciculate erect rhizome; bipinnate with lanceolate-acuminate pinnæ, and oblong-obtuse pinnatifid pinnules, cuneate at the base, the margin dentate. Sori linear, forked oblique, subsequently confluent, nearly covering each segment of the pinnules.

9. G. charophylla, Desvaux.—A tender, delicate, fragile, annual stove Fern; native of the West Indies and various places in South America. Fronds decompound, triangular, bright green, from six to eight inches high, with roundish ovate pinnatifid pinnules, deeply dentate, and cuneate at the base. The fertile fronds are erect,

and the pinnules very much contracted.

10. G. Leptophylla, Desvaux.—An extremely delicate annual stove species; from the South of Europe, Madeira, &c. This little Fern attains the height of but a few inches. The fronds bipinnate, smooth, with roundish cuneate, two or three lobed pinnules, and each lobe bluntly dentate. Sori forked, confluent. Fertile fronds not contracted, and nearly all fertile.

EPTOGRAMMA, J. Smith.—Name derived from leptos, slender, and gramma, writing; alluding to the narrow lines in which the sori are disposed.

Veins pinnate, venules simple, free, parallel, usually external. Sori oblong-linear, medial, oblique, composed



Fig. 8.

of a few spore-cases, which are sometimes echinate. Fronds bi-pinnatifid, from one to two feet long, smooth or villose. Rhizome easpitose, creeping.—
This genus has undoubtedly a considerable affinity with several of the preceding ones: it may be viewed as forming a link between Grammitis, Polypodium, and Gymnogramma. Its elongated sori

are similar to Grammitis; but it is separated from that genus by its habit and the different formation of the veins. It has the habit and venation of many species of Polypodium, but is distinct from them in its linear sori. It is very closely connected with Gymnogramma, being distinguished from that genus only by the veins and sori being simple. There are many species belonging to Leptogramma, but only one at present in cultivation. Fig. 8 shows the upper portion of a pinna of L. villosa (med. size).

1. L. villosa, J. Smith. (Gymnogramma villosa, Link).—A beautiful evergreen stove Fern, from Brazil. Fronds hairy, bipinnatifid, about two feet long, reclining, with linear-lanceolate acuminate pinnæ, and rather ovate, bluntly acuminate segments. They are lateral, adherent to a cæspitose creeping rhizome. Sori oblong, near medial oblique.

### ON THE GERMINATION OF FERNS.

BY ARTHUR HENFREY, F.L.S., LECTURER ON BOTANY AT ST. GEORGE'S HOSPITAL.

MHIS subject having attracted a good deal of attention lately, it may be interesting to some of the readers of the *Gardeners' Magazine* to have an account of the principal phenomena which have been recently observed, and of the views entertained respecting the reproduction of the plants.

It has long been known that when the spores of the Ferns germinate, they first produce little disks of green cellular tissue, lying like collections of little green membranous scales upon the surface on which they are growing. About ten years ago, Professor Nageli of Zurich observed a peculiar structure upon these little germinal fronds, consisting of cellular bodies, from which were discharged spiral filaments, moving rapidly and apparently voluntarily through the water in which the object lay beneath the microscope. The discovery of these organs was not much noticed at the time, but about four years ago Count Leszczyc-Suminski of Berlin made a complete series of observations on the germination of the Ferns, and published an elaborate and fully-illustrated account of them, in which he not only confirmed the statement of the existence of these so-called antheridia of the Ferns, but showed that there existed two kinds of cellular organs upon the young germ frond, which organs he considered to represent the two sexes, and to correspond to the antheridia and pistillidia of the mosses.

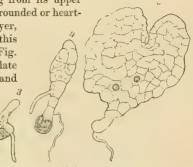
I have examined these structures myself, and can confirm completely, in most respects, the account Suminski has given of their general structure; but my observations have not yet been sufficiently extended to enable me to give an opinion on the physiological questions relating to them, which I shall

presently speak of. In the first place, therefore, I will describe these bodies as I have seen them, and in a manner which will enable any one possessing a microscope to repeat them for himself.

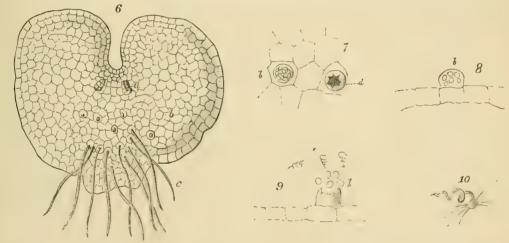
The germinal frond must be taken very young, while yet not more than one-eighth of an inch in diameter, and before any sign of the first leaf appears rising from its upper surface. The little frond will then be found in the shape of a rounded or heart-

shaped disk, formed of delicate green cells, (Fig. 6); a single layer, except in the middle, having been gradually developed into this form through the stages represented in the annexed figures (Fig. 1—5). To see the peculiar organs, the disk-like cellular plate must be carefully laid face downwards upon a slip of glass, and washed clean, gently removing the grains of soil with a camel-hair pencil, from among the rootlets. When placed under the microscope a number of projecting cells

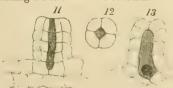
under the microscope a number of projecting cells (Fig. 6, b) are generally found scattered about the frond. These are seen to be again filled with minute vesicles (Figs. 7 and 8) which



escape by the bursting of the protruding cell, either spontaneously or by slight pressure on the glass covering the object (Fig. 9). As the vesicles emerge they burst also, and from them springs out a spiral thread-like body, thickened at one end, and furnished with cilia, as represented in the wood-cut



(Fig. 10). These, the so-called animalcules, swim about with great rapidity, shooting forward, and continually whirling round on their own axes. To see them clearly their motion must be stopped by adding a little solution of iodine.



On the thickened part of the frond, near the notch, are to be found in most cases, not always, cellular structures of larger size, and more complicated (Fig. 6, a). They consist of conical papillæ, with cellular walls, containing a cavity in the centre, as represented in

the figures (11 and 12).

Now, the statements of Suminski are to

the effect that these last bodies represent ovules, and that a little cell exists at the bottom of the cavity (Fig. 13), which becomes fertilized by the entrance of one of the spiral bodies, in a manner supposed to have some analogy to the entrance of the pollen-tube into the ovules of flowering plants.

My own observations have not afforded me a view of any process of this kind; and elaborate investigations have been made since the publication of Suminski's paper by two skilful German anatomists, Dr. Wigand and M. Schacht, with a view to confirm or refute his assertions, so important in a physiological point of view. They

both agree in stating that very extensive research has failed to reveal anything like an entrance of



the spiral bodies into the so-called ovules; and M. Schacht further avers that in the young stages of the "ovules," at which stage Suminski states the fertilization takes place, the cavity is closed up.

The evidence, therefore, is at present against Count Suminski's views, yet I am inclined to think that the point is by no means decided; and, at all events, the import of the remarkable structures remains to be cleared up. The first leaf emerges from the substance of the cellular thickening of the germinal frond, which is carried up a little way in a kind of sheath. The "ovule" or several, may often be seen attached to the side of this sheathing process of tissue. It is the opinion of Count Suminski that the first leaf is developed from the minute cell which, he says, lies at the bottom of the "ovule," just as the embryo is in the embryo sac of a phanerogamous ovule; but, if this were the case, there would be the striking difference that the embryo bursts through the coats of the ovule at the side, the radical extremity not pointing to the canal where the fertilizing influence enters, as in the flowering plants. The second leaf of the young plants is developed in the axil of the first, and so on, the little Marchantia-like germinal frond soon decaying away.

### DESCRIPTION OF FIGURES.

- 1, 2, 3, 4, 5, Successive stages of development from the spore (Fig. 1). In Fig. 5 are seen two of the antheridia.
  6. A germinal frond (it is a simple cellular plate like the leaf of a Moss): a are two "ovules;" b a number of "antheridia;" c root fibrils.
- 7. A more highly magnified view of a piece of the frond, with two "antheridia," one containing the vesicles (b), the other burst (d).

8. Side view of b in the last figure.

9. The same bursting to discharge the vesicles, which again discharge the spiral filaments e.

10. One of the spiral filaments or "animalcules" more magnified.

11. Side view of an "ovule."

- 12. The summit of the same, seen from above.
- 13. Side view of an "ovule" from Suminski, representing the embryo-cell at the bottom of the cavity.

14, 15, 16. Germinating Ferns, with the young leaves springing up from the germinal frond.

### HORTICULTURAL SOCIETY.

January 14.—The most remarkable object on this occasion presented to the meeting, and for which a large silver medal was awarded, was a cut specimen of Amherstia nobilis, from the garden of Mrs. Lawrence of Ealing Park, where only in this country this noble Indian tree has been made to produce its flowers. This tree was originally found by Dr. Wallich growing in the garden of a monastery at Kogun, on the Saluen river, and was subsequently met with by the late Mr. Griffith in the forests of Martaban, in the Birman empire. The fine pinnated foliage of this tree, together with the gaily coloured and curiously formed blossoms, in which a charming deep salmon-pink is predominant, render it indeed worthy the name of "nobilis." The singular form of the cæsalpineous flowers is rendered still more remarkable by the presence of a pair of large salmon-coloured bracts at the base of the corolla, and at first sight appearing as if forming part of it. Now that a blooming habit has been induced in the plant at Ealing Park, it may be expected to bloom annually. Mr. Loddiges of Hackney sent a plant of the rare Ansellia africana from Fernando Po,-remarkable, among other things, as being one of the few orchids which grow naturally on the stems of Palm trees! the Ansellia occurred on that of the Elais. From Mr. Beck of Isleworth were three specimens of Oncidium, and a group of Cinerarias, sent with the view of showing that neat blooming plants of this favourite flower may be had by sowing the seeds about May. From a May sowing Mr. Beck had raised plants blooming since November. Several flowering plants were sent from the Society's garden. Mr. Davis of Oakhill contributed a fine basket of West's St. Peter's Grape; and samples of the Rose-girdle were sent by the inventor, Captain Armstrong, of Cobham, Surrey; they consist of a band of zinc, the ends of which are fastened by a nut and screw, and are intended to serve both as a fastening for standard plants, such as roses, and as a label on which the names may be inscribed; being neat, if they prove to be durable, about which we have some misgivings, they will, no doubt, be extensively used in highly kept gardens. Some fruit of Hubbard's Pearmain, a hardy, prolific, and richly-flavoured Apple, worthy of general cultivation; and of the Easter Beurre, and Beurre Ranz Pears, were sent from the garden of the Society.

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### HELIOTROPIUM PERUVIANUM—VAR.: SALTER'S GEM.

Nat. Order .- BORAGINACE.E.

Generic Character.—Heliotropium, Linnæus.—Calyx fiveparted. Corolla hypogynous, salver-shaped, without teeth, naked or bearded in the throat, the limb five-toothed, with the indentations simple or containing a small tooth. Stamens five, inserted on the tube of the corolla, included. Orary four-celled; ovales solitary in the cells, pendulous; style terminal, very short; stigma peltate. Fruit dry, composed of four separable cocci, which are one-celled, one-seeded, three-sided, and keeled at the central angle. Embryo exalbuminous, straight or homotropously arcuate; cotyledons fleshy; readicle terete, superior.—Herbs or under shrubs, luxuriant in a large number of species in tropical and sub-tropical regions all over the

world, more rare in temperate climates; leaves alternate or sometimes sub-opposite or ternate, most frequently hispid, entire; spikes terminal and lateral, solitary or conjugate, generally spirally curled in the young condition.—(Endlicher Gen. Plant. 3751).

Heliotropium Peruvianum, Linnæus. — Stem shrubby; leaves petiolate, ovate or oblong lanceolate, wrinkled; spikes terminal branched, the tube of the corolla hardly the length of the calyx.

 $V_{AR}$ .: Salter's Gem. — Flowers large, deep purple with a white eye.

bushy habit. The leaves are hairy, ovate-lanceolate, in size and form resembling those on vigorous branches of the common Heliotrope, but of a deeper green, and they do not become blackened or discoloured from the effects of slight cold, as is the case with the garden variety from which this was raised. The flowers grow in large clustered recurved spikes, on which they are very closely arranged; the corollas are larger than in the parent species, of a very deep blue purple colour, with a broad white centre. From the size and compactness of the clusters themselves, and the large size and strongly-contrasted colour of the flowers, this is assuredly the most striking and distinct variety of Heliotrope which has yet been obtained.

History, &c.—We saw this seedling Heliotrope when first coming into bloom, during the past summer, in the nursery of Mr. Salter of Hammersmith, where, at a later period of the season, the drawing from which our plate has been prepared was made. Its history is thus stated to us by Mr. Salter, whose remarks on its peculiarities quite agree with our own observations:—"The Heliotrope 'Gem' is a garden variety, raised by myself in 1849 from Voltaireanum; it, however, differs from it in several essential particulars, not having either the rambling habit of its parent, or being subject to the great disadvantage of the leaves changing colour in autumn. The Gem is of a very robust and bushy habit, bearing a profusion of exceedingly compact trusses of flowers of a deep blue purple, with a large white centre; the odour is quite as fragrant as in any of the other kinds. This variety will be found a great acquisition for bedding and pot culture."

CULTURE.—The culture of Heliotropes is so well understood, that we need only observe, that the variety now figured is adapted for all the purposes to which the Peruvian Heliotrope is usually applied.—M.

### THEORY AND PRACTICE OF PRUNING.

BY MR. HENRY BAILEY, NUNEHAM PARK, OXFORD.

IT is, indeed, a wise dispensation of an All-bountiful Providence, that man should not find the fruits and flowers of the earth in their natural state, in their fullest perfection, without exercising his reasoning powers, or exerting his physical capacities. If such were the ease, he would lose an invaluable boon in the calm and pure gratification which he enjoys when studying the causes and tracing the effects which are to be observed in vegetable life, and taking that exercise which is so conducive to health. There is, perhaps, no greater gratification than is experienced by those who cultivate a garden, when a shrub which they planted with their own hands becomes a fine specimen, or a long-cherished fruit-tree yields its produce. Who can tell the beauty of the one, or describe in terms sufficiently mellifluous, the lusciousness of the other!

In seeking to obtain the desired results from trees and fruit-bearing shrubs, the art of pruning (judiciously exercised) is of much consequence; but, unfortunately for those who wish to obtain information on the subject, there is little to be found in a sufficiently condensed state to suit the generality of persons. Much has been written in old books in a quaint and dogmatical style, but little exists in a popular form, unless in isolated papers in the Gardeners' Chronicle. In some measure, to supply this

desideratum to the amateur, will be attempted in the series of papers it is proposed to give in the Gardeners' Magazine of Botany, and it is hoped that, by the aid of the illustrations, the principles inculated will be found sufficiently intelligible.

When we consider the importance of the various products of trees to the human race, whether as yielding timber, fruits, or the various substances used in our arts and manufactures, we must admit that they are second to none of the gifts of nature, and that the art, which has for its object the concentration of their energies for specific purposes, is truly worth attention. The importance of pruning admitted, it is obvious that the results of the practice must be in proportion to the amount of skill employed by the pruner. In addition to quick and clever manipulation, he should possess great discernment, and see (in his mind's eye) the result of each stroke of his kuife before he makes the cut. This dexterity and

fore-knowledge can only be attained by long practice.

I would here make a distinction as to two diverse modes of pruning, one of which I will designate as summer or preventive pruning, and the other as the remedial. The latter is the kind adopted by our older gardeners, the former is practised by the most clever men of the present day. For instance, our forefathers allowed their pear-trees to produce a forest of luxuriant brushwood, which, in a given month, upon a given day, was annually cut off-only to exhaust the energies of the tree in producing another useless crop of shoots. How different is the practice now! The modern gardener endeavours to balance the growth of his tree, by allowing no more branches and leaves to be produced than can perform their functions, and assist, by their full exposure to light, in elaborating and storing up organizable matter for the production of the fruit or the flowers he desires to have. He removes unnecessary shoots when in embryo by rubbing them off, and arrests the progress of luxuriant ones by timely pinching. He will leave luxuriant growths at their full length, or nearly so; depressing their points to make them push from every bud fruitful twigs of a moderate growth; or he will prune back to two or three buds a weak shoot, and elevate its point perpendicularly, in order that the sap which would have had to support a number of shoots, may be concentrated and produce a more vigorous growth. If he desires to increase the strength of his trees, he will prune early in autumn, that the sap accumulated by the roots during winter may not be wasted. Thus, the buds which are retained will appropriate the whole store of nourishment, and more robust growth will result. Nor will he forget, that it is as necessary to prune and control the roots of trees as it is to prune their branches.

What I shall here designate as remedial pruning, ought scarcely ever to be required in a garden except in the case of dead branches. In our woods and forests, casualties are of frequent occurrence, and amputation of limbs becomes necessary; but this may rather be termed lopping than pruning. I fully believe, that all the pruning which timber trees require, and fruit trees ought to have, may be done in the early stage of their growth with the finger and thumb, and a moderate sized knife, and there will be no perceptible blemishes in after years if it is thus performed. The saw, the axe, and the bill-hook, have no place in modern gardening operations, save in the accidental cases I have named: they belong

to the period of Vandalism, and are now wielded but by Gothic hands.

The sagacious and observant John Evelyn, writing in the year 1669, says, that "the ancients found such benefit in pruning," that "they feigned a goddesse presided over it." He says also, that "a skilful pruner should be early at this work;" and, afterwards, quoting from his countryman, "honest Lawson (Orchard)," "All ages," saith he," "by rules and experience, do consent to a pruning and lopping of trees. Yet have not any that I know described unto us (except in dark and general words) which or what are these superfluous boughs which we must take away." The age in which we live is, perhaps, one which would have made this (in his day) clever and useful man more happy, could he have known how much our practices in gardening affairs differ from the time-honoured usages of his day. We consent to a pruning, but abjure the lopping process. Evelyn further says, "'tis misery to see how our fairest trees are defaced." It is to be feared, that could he revisit us, he would find too much reason to make a similar exclamation with regard to the management of trees for timber. For it is a fact, that, by far the greatest proportion of our forest trees have no pruning at all, and are confided to the management of men who have no knowledge of those principles which are indispensable to good culture. When we consider the vast importance of our timber in a national point of view, this seems extraordinary. While horticulture and agriculture take rank with the sciences, and have the highest patronage, poor arboriculture barely receives a passing consideration, unless it be that which occurs when there is to be a felling of timber.

Early autumn, as soon as the leaves of a tree have performed their functions, is generally chosen as the fittest time to perform the operation of pruning, because, after the superfluous branches are removed, the whole of the sap accumulated during the winter season is devoted to the development of the buds which are considered necessary—" provided always" that the tree is not of plethoric growth;

but if the summer processes have been well attended to, there will be little to do in the way of winter pruning, at least, much less than formerly.

However sound and correct the general rules for pruning may be, as there is no rule without exception, so, in this case, much must be left to the discretion of the operator; but there are certain fundamental principles which must not be lost sight of under any circumstances; these are:—

1. To expose every part of the tree to the full action of solar light.

2. To allow no branches or foliage to be produced which cannot perform their functions properly; to arrest their growth in an embryo state, rather than allow them to misappropriate the food which by attention might be made available to the results which are desired.

3. Always to remember that fruitfulness and luxuriant growth are opposite qualities, and that what is conducive to the one is inimical to the other.

4. To endeavour to avoid the extremes of luxuriance and fruitfulness, nothing being more injurious in its effects than the weakness induced by over-cropping. To endeavour, in fine, so to regulate the energies of the tree, that, while it produces fruit, it has sufficient strength to perfect it.

The pruner, then, has a delicate and complicated operation to perform; one that cannot be perpetrated in ruthful ignorance, but must be based upon a knowledge of the laws of vegetable physiology, and confirmed by practice, reading, and constant observation, and withal adroitly executed. I proceed to apply these remarks to the various subjects which come under the heads of forestial and horticultural pruning. I shall, under the former head, consider and offer some suggestions upon (1.) The nursery treatment of young forest trees as to root pruning: (2.) Pruning the branches of trees intended for timber and effect: (3.) The pruning of fruit trees and its application to particular subjects, viz., the Vine, Fig, Peach, Morello Cherry, Plum, Cherry, Apple and Pear, Gooseberry and Currant, Raspberry, and the Filbert.

SUGGESTIONS RESPECTING THE NURSERY TREATMENT OF YOUNG TREES AS TO ROOT PRUNING.

The importance of early education, in forming the human character, is universally admitted. "Train up a child in the way he should go," says the wise man. We say, apply the same principle to your trees, and whatever is their ultimate object or destination, begin early "the delightful task" of teaching them "how to shoot."

The treatment which the roots of trees receive in the nursery, is, in our opinion, of material importance, and may differ much, with equal propriety, according to the object of the planter, who may either desire to induce rapid and luxuriant growth, or to obtain fructiferous properties. It is customary, in most nurseries, to cut the roots of seedling oaks with a spade in the second year of their growth, to transplant frequently afterwards, and, on every occasion of removal, to trim the strongest roots. The plants so treated are generally considered eligible for removal; they are sure to live; but instead of sending up good leaders, they mostly produce weak shoots, and grow stunted and forked, having a stronger resemblance to the miniature old trees of the Chinese gardeners than the characteristic vigour of the British oak. Rapid growth is a condition not to be disregarded in growing trees for timber, provided always that such growth is fully exposed to the influence of solar light, which alone can give solidity to the newly formed tissues. It appears to us, that, when we contrast the means given by nature to the oak for ample development and sturdy growth, we are not taking the proper course to attain our ends, as it is most probable that the finest oaks now in existence, (such, for instance, as the Panshanger), are the offspring of acorns which accidentally sprang up where they still stand. Such was, doubtless, the origin of the largest oaks at Windsor; and those magnificent relics of the once royal domain of Woodstock which are still remaining, the almost imperishable record of past ages. Surely, when we view these noble products of unassisted nature, it should lead us to reflect upon the fitness of our customary procedure, and ask ourselves if it may not be a blind empiricism, rather than rational practice. We require vigour; we take the most effectual means to check it.

The observation we are about to make does not precisely fall within the scope of this article, but as it is collateral with it, we think it not irrelevant to say, that we believe that if our forest trees were sown where they are to remain, or planted permanently when very young, it would tend much to restore them to their pristine vigour, and induce those gigantic proportions which we alone see or read of as developed in natural forests.

The axiom that whatever is conducive to luxuriant growth is inimical to productiveness, has been touched upon. We will only now say that it has also a vice versa bearing. It follows, therefore, that although it is not wise to curtail the young roots of our forest trees, it is most sound, sensible, and efficient practice, to control those of our fruit trees. We would scrupulously preserve the tap root of an Oak or a Pine, but would atterly annihilate such an organ in the Apple, Pear, Plum, or any other

fruit-bearing tree. Moderate growth, abundance of surface roots, and well-ripened wood, are the desiderata to be aimed at with fruit trees; and root pruning should be commenced in the nursery, and carried on with discretion during the whole course of their existence.

Autumn, early autumn, is the best period for pruning the roots; as soon as the "sear and yellow leaf" appears, it may commence. It is important that the jagged and ragged cuts made by the spade should be smoothed by the knife, and we would carefully remove the soil from the roots, selecting only the strongest for operation. Root-pruning is certainly one of the first principles in the successful culture of fruit trees. Its importance is obvious when we consider the reciprocal action which exists between roots and branches, and the control which it gives over the energies of the subject so treated. Although it has not been general amongst English gardeners till latterly, it has long been so among the Dutch. It is not difficult to conceive what would have been the fate of such a thing as that of pruning the roots of plants half a century ago. With what zealous indignation would the gardening worthies of that day have scouted the man who had the temerity to make such a suggestion, or to hint at such a horticultural heresy? "Necessity" is said to be "the mother of invention," and our onward progress in this, as in all other arts which minister to the comfort and luxury of mankind, will be in proportion to the increased demand which will arise as we progress in education and refinement. Let us discard prejudice, and believe nothing impossible.

# PRUNING THE BRANCHES OF FOREST TREES FOR TIMBER AND PICTURESQUE EFFECT.

Among the various modes of pruning which have had their advocates in the gardening periodicals, I am not aware that any distinction has ever been made between those whose object is simply to produce useful timber, and those whose aim is to produce objects of picturesque beauty. The treatment of such trees is but too generally confided to ignorant workmen, who believe that the nearer approximation trees make to scaffold poles, the greater is their beauty and perfection. But the discriminating manager will make this difference between the marginal and interior trees, that, while he prunes and fore-shortens the latter to throw all their energies into one trunk, he will only seek to obtain in the former a certain height of clear stem, leaving the head to diverge and ramify according to its natural habit.

The pruning of forest trees, as commonly practised, is what we consider more properly a mutilation, generally performed in a rough and







Fig. 2.



slovenly manner, by chopping off with a bill branches of considerable size. We protest against the use of this instrument, and recommend, and believe, that all the pruning which timber trees require may

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be done with a knife, or the finger while young. We would adopt what we have called preventive pruning, allowing no unnecessary growths to require lopping by becoming too large. We think that, in the case of a young tree whose stem we wish to increase, it is desirable to spur in the side branches for a year or two, as the nurserymen do with the Pear and Apple stocks, gradually and annually removing a tier or two of the lower spurs till a sufficient length of clear stem is obtained. It is contended by some, that every branch of a tree is of service to it, and should not be removed. When it becomes really a branch, such removal is always attended with mischief. The great point for the pruner to bear in mind is, that the secretions of trees do not depend upon the quantity of shoots and foliage, but more upon the latter having full exposure to the action of light. The quality of timber grown in the dense gloom of the interior of a wood, is, for this reason, inferior to that afforded by the marginal trees.

We would deprecate (unless in very exposed situations) the system of introducing what are called "nurses," but which are rather destroyers as generally employed. We say, plant forest trees with the roots nature has given them; plant while very young, or sow the seeds, and commence pruning almost immediately; spur in the young side shoots, remove rival leaders, and annually remove some of the lower spurs from the stem before they are large enough to cause a wound. In vigorous trees, choose the spring for the operation, when the wound is quickly healed.

In illustration of the good effects resulting from the practice we recommend, we refer to the accompanying figure of a portion of the stem of a young Elm—the stem from which it was taken being about eight feet in height, and its diameter, midway up it, four inches. Fig. 1 represents about a foot of its trunk as taken from the middle; it is cut longitudinally down the middle, and the grain is clear, straight, and free from blemish. Fig. 2 is another section of a similar tree, showing a knot which has resulted from allowing the side shoot to become too large before removal. The benefit of early or preventive pruning, and the evil of late or remedial pruning, is here plainly shown. Fig. 3 represents the stem of a young tree in process of pruning—the lower branches removed, the upper spurred in.

In pruning cone-bearing trees (conifers), it is good practice to fore-shorten the branches before removal. It is impossible, however, to lay down rules for every contingency, and much must be left after all to the judgment of the operator. But of this we may rest assured, that if pruners are more automatons, and not observers, much that is fundamentally correct in theory may be misapplied in practice.

In conclusion, then, we say to the fruit-pruner, remember the delicate fabric with which you have to deal. Think that it is yours to assist, and not to do violence to nature. Ever reflect that it is to preventive treatment and close observation of cause and effect that you must look for success; and, instead of leaving young woods unpruned for twenty years, and till they are utterly ruined, begin betimes "to train them up in the way they should go." So shall you acquire lasting honour, and your country reap benefit.

## BOTANICAL FRAGMENTS.

R. LINDLEY proposes to separate the *Tree Pæonies* from the genus Pæonia, on account of the tough leathery coat which is drawn tightly around their carpels, allowing nothing but the stigmas to project; this organ, properly referred to what botanists now call the disk, has no existence in the true Pæonies; "it is in all probability an innermost row of abortive stamens, the filaments of which are united into a cup, while the anthers refuse to appear." The new genus is named Moutan, and the common species M. officinalis.—(*Paxt. Fl. Gard.*, i. 161).

The beautifully marbled-leaved plant described as Eriocnema marmoratum at p. 135 (vol. ii.), is properly a species of Bertolonia, named B. maculata by Martius, according to Sir W. J. Hooker, who observes: "The fruit or capsule is an elegant object, especially when the eye is aided by a small power of the microscope; for it is singularly inflated, with three very prominent angles, and several ribs, and every rib, as well as the margin of the lobes of the calyx, is beset with bristles terminated by a gland."—(Bot. Mag., t. 4551).

Professor Göppert has described the lower end of a trunk of Pinites protolarix, a *gigantic fossil* tree, which was found in the brown coal of Laason, in Silesia, in 1849. It measured more than 32 feet in circumference, and about 4 feet in length; erect, perfect in form, but stripped of bark; 16 vast roots ran out at right angles from its base. The interior was filled with structureless brown coal; but in sections of the outer parts, one 16 inches broad, the other 3 feet 6 inches, Professor Goppert counted respectively 700 and 1300 rings of wood; so that for the half diameter of 5! feet at least 2200, but

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probably 2500, rings must have existed. According to the theory of annual rings, this tree would appear to have been from 2200 to 2500 years old; but, unfortunately, the annual ring theory is not always trustworthy.—(Bot. Gaz., iii. 13).

The Diamba plant of tropical western Africa, called also Congo tobacco, is smoked by the native Africans to produce the pleasing excitement of intoxication! It is smoked from a large wooden pipe or reed called condo, or from a small calabash, or sometimes from common clay pipes. The liberated Africans and Creoles frequently meet at each other's houses; and on these occasions the pipe is handed about from mouth to mouth, and soon produces the desired effects—agreeable sensations, laughter, &c.; a continuance, however, causes temporary frenzy, and intense and maddening headache, accompanied by stupor. The plant is the Cannabis sativa, or common Hemp, which on fertile soils, at Sierra Leone, grows twelve or thirteen feet high, and twenty feet in circumference. The flowers slowly dried, and mixed with the seeds, are the parts preferred, and in this state the drug is called maconie. The leaflets are sometimes used; they are called makiah. A small plant in flower and seed will yield its owner ten shillings' worth of Maconie.—(Hooker's Journ. Bot., iii. 9). The Hemp is a plant of most powerful properties, as is evident from the numerous preparations of it employed in India; but no stronger evidence is needed to prove the influence of climate on vegetable productions than the fact that Hemp grown in our cool and moist climate scarcely at all developes these properties.

The annual Branching Larkspurs are no longer to be called Delphinium, that is, if botanists and cultivators so will it. Dr. Lindley proposes (Paxt. Fl. Gard., i. 168) to re-establish Bauhin's old genus Consolida, the grounds of separation from Delphinium being thus stated: "its petals being reduced to two, and these completely combined into one, remove it from Delphinium. That the petaline body is really composed of two parts only, seems to be proved by its origin, which looks as if opposite the back sepal, in consequence of the union of the two contiguous edges of the lateral petals. But it is completely separated from the front sepals, with which it does not in any degree alternate. These considerations lead to the conclusion that the old genus Consolida should be re-established."

The Brayera anthelmintica, or Kooso, a rosaceous tree of the tribe Dryadeæ, has proved beyond doubt a specific for tape-worm. It is an Abyssinian tree, and its virtues were first brought into notice by the traveller Bruce, who states that the Abyssinians of both sexes, and of all ages, evacuate once a month a large number of worms of the sort called Ascarides, to promote which an infusion of the Casso flowers is employed, and proves to be at once gentle, safe, and efficacious. "It is an instance," remarks Bruce, "of the wisdom of Providence, that the range of this tree does not extend beyond the

limits of that disease of which it seems designed to be the cure."—(Hook. Journ. Bot., ii. 349).

The Cedron of the Magdalena River, Simaba Cedron of Planchon, has long been celebrated in New Grenada for its powerful medicinal properties. It is a small tree with an erect stem, crowned by an umbellate mass of branches with large handsome pinnated foliage. The seeds are considered an invaluable specific for the bites of snakes, for intermittents, and for stomach complaints generally. They are so highly prized as to sell for a sum equal to one shilling each. The bark and wood of the tree abound in a high degree with the bitter principle, which occurs in the order to which the Cedron belongs, namely Simarubaceæ. Some French physicians who have made experiments on different animals hope by means of the Cedron seed to arrive at the cure of mental disorders and epilepsy. Dr. Pereira doubts that the seeds will prove to be an antidote against snake poison, as they are confidently held to be by the Panama doctors; but as possessing an intensely bitter principle, the plant will rank with its near botanical allies, Quassia and Simaruba—(Hook. Journ. Bot., ii. 377).

At a meeting of the Botanical Society of Edinburgh (Nov. 14, 1850), Dr. Balfour exhibited the following specimens illustrating the production of Vinegar:—1. The so-called Vinegar plant, with Vinegar produced by it. 2. Syrup, into which the plant had not been introduced, but which had been left for four months undisturbed; in it a peculiar fungus-like growth similar to the Vinegar plant was found, and the fluid had become Vinegar. 3. A specimen of Vinegar produced by the Vinegar plant, which had been filtered, and then allowed to stand for several months, and in which a fungus similar to that called the Vinegar plant had been formed. Dr. Balfour thought the so-called Vinegar plant must be considered the mycelium of some fungus produced in a peculiar fluid, and which acted as a ferment. The addition of any ferment would probably cause a similar production of Vinegar. The Rev. M. J. Berkeley has determined the Vinegar plant to be the mycelium of the Penicillium glaucum of Greville; this mycelium forms a close tough crust-like or leathery web, and rapidly augments the acetous fermentation of saccharine fluids. Some four or five years since we made some experiments with this Vinegar plant; but in our experience the saccharine fluid without the plant became fetid, whilst, under the same conditions but with the plant placed in it, it was converted into very good vinegar.—M.

# New and Kare Plants.

Catasettm Lansbergii, Lindley. Lansberg's Catasetum (Paxt. Fl. Gard. i. 156).—Nat. ord., Orchidaceæ, § Vande.e-Catasetidæ.—Syn., Myanthus Lansbergii, Reinwardt and De Vriese.—A terrestrial stove orchid, very near to, if not the same as, C. callosum, from which according to Dr. Lindley, it can scarcely be distinct as a species. It has long ovate racemes of from thirteen to twenty flowers, which are green, spotted with purple, and not whole coloured as in C. callosum. From the Caraccas. Introduced to the Botanic Garden at Leyden. Flowers in autumn.

Burlingtonia Pubescens, Lindley. Downy-leaved Burlingtonia (Paxt. Fl. Gard., i. 158).—Nat. Ord., Orchidaceæ § Vandeæ-Ionopsidæ.—A beautiful dwarf stove epiphyte, stemless, with dark green coriaceous rigid leaves, growing in broad tufts, and bearing a profusion of short dense drooping racemes of rather small white flowers, which have a downy column, an obovate two-lobed shortly hastate lip, marked with three yellow ridges on each side near the base, and a pair of erect side lobes, which give it the hastate form. From Pernambuco. Introduced originally by Messrs. Loddiges, before 1846; and subsequently by J. Knowles, Esq., of Manchester. Flowers in autumn.

Primulae.—A very pretty and distinct-looking nearly hardy herbaceous plant, with a rough roundish root-stock, from which proceed numerous radical leaves four or five inches long, oblong lanceolate, rather obtuse, and denticulated, rugose above, farinose beneath. The scape is about a foot long, mealy, terminated by a dense globose head of perfectly sessile flowers, the limb of which, about a quarter of an inch across, is deep purple on the upper face, paler beneath; they are faintly fragrant, but this is, in part at least, owing to the "farinaceous substance of the leaves and flowers." It is impatient of water overhead, and needs the protection afforded to other delicate Alpine Primulas. From India: Lachen, Sikkim-Himalaya, one of the passes into Thibet, ten thousand feet elevation. Introduced in 1849 by Dr. Hooker. Flowers "in October," probably at other periods. Royal Botanic Garden, Kew.

Ungnadia speciosa, Endlicher. Showy Ungnadia, or Spanish Buckeye (Paxt. Fl. Gard., i. 153).—Nat. Ord. Sapindaceæ § Hippocastancæ.—Syn., U. heterophylla, Scheele.—A slender hardy deciduous shrub, commonly growing from five to ten, rarely twenty feet high, with many long stems branching only at top. It has digitate leaves, the leaflets ranging from five (or even three in the earlier leaves) to seven in number. The flowers which are rose-coloured, have sometimes four, sometimes five petals. Nearly related to the Pavias. The fruit is sweet and pleasant, but, according to Lindheimer, emetic. From Texas. Introduced?——. Not yet flowered.

Oxyspora Vagans, Wallich. Weak-stemmed Oxyspora (Bot. Mag. t. 4553).—Nat. Ord., Melastomace Melastomace.—Syn., Melastoma rugosa, Roxburgh.—A loosely-branched subscandent stove shrub, with obscurely four-angled stems, bearing ovate or cordate-ovate acuminate leaves, five to seven nerved, and smooth above. The flowers grow in terminal drooping panicles, often a foot long and very graceful, bearing on the many-forked branches numerous bright rose-coloured four-petalled flowers, from which project four long purple and as many short pale-coloured stamens; the flowers are about an inch in expansion. From India: hilly country bordering on the plains in the approach to Darjeeling. Introduced in 1849, by Dr. Hooker. Flowers in autumn. Royal Botanic Garden, Kew.

Epidendrum Longipetalum, Lindley. Long-petalled Epidendrum (Paxt. Fl. Gard., î. t. 30).—Nat. Ord., Orchidaceæ § Epidendreæ-Læliadæ.—Syn., E. aromaticum, var. of some gardens.—An interesting stove epiphyte, with ovate pseudo-bulbs, straight blunt sword-shaped leaves growing in pairs, and long loose panieles of dull brownish purple flowers, which however are very sweet-scented; the sepals and petals are nearly alike in form, spathulate, brownish purple, with a green margin; the lip three-lobed, the segments rounded, the lateral ones creet, the central larger convex, notched and wavy, with elevated crimson radiating veins on a yellow ground; the rest of the lip white. From Guatimala. Introduced about 1848. Flowers in summer. Horticultural Society of London.

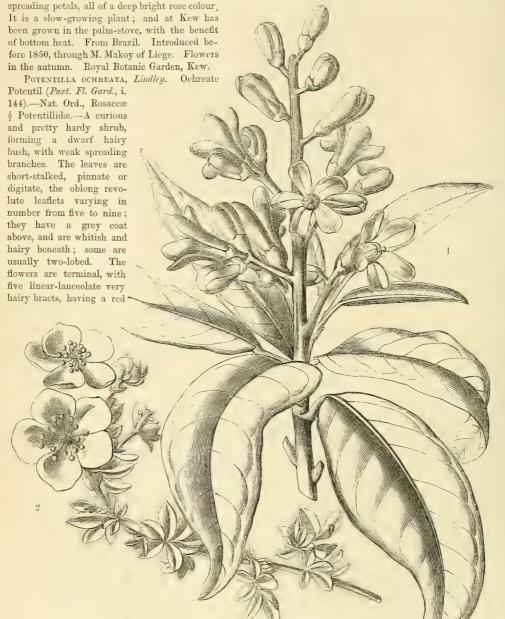
EPIDENDIUM VIRENS, Lindley. Green Epidendrum (Paxt. Fl. Gord. i., 152).—Nat. ord., Orchidaceee § Epidendreae-Laeliadae.—A stove epiphyte, allied to E. longipetalum. The flowers grow in loose narrow erect panieles, and have linear oblong sepals and spathulate petals of a green colour, and a lip of three nearly equal lobes, the lateral ones erect, green, with crimson veins, white at the point, the central one convex, plaited, white with crimson veins. From Guatimala. Introduced?——.

Centrosolenia Glabra, Rentham. Glabrous-leaved Centrosolenia (Rot. Mag., t. 1552).—Nat. Ord., Gesneracea § Gesnerae. A rather pretty erect-growing semi-epiphytal herbaceous stove plant, with succulent reddishbrown stems, bearing smooth succulent leaves, which are opposite, each pair being singularly unequal in size; one being small lanceolate-acuminate, the other large ovate, tapering to both extremities, the margins serrated. The flowers are aggregated in the axils of the lower leaves, on short stalks; the corolla tubular an inch and a half long, downy externally, projecting below into a short obtuse spur, enlarged upwards, and dividing into a limb of five broad short lobes, of which the three lower are fringed with long thread-like lacinia; they have a yellow throat. From La Guayra. Introduced about 1848 by M. Wagener, a German collector. Flowers through the autumnal and early winter months. Royal Botanic Garden, Kew.

Tillandsia erythrea, Lindby. Red-bracted Tillandsia Part. Fl. Guid., i. 160). Nat. Ord., Bromeliacca.

—Syn., T. bulbosa picta, *Hooker*.—A stove epiphyte with the habit of T. bulbosa, from which it is distinguished by having long upper leaves, a distinctly-branched spike of flowers, deep crimson foliaceous bracts, apparently not scurfy, and a longer white-edged corolla. From Jamaica and Para. Introduced in 1845. Flowers in winter.

Almeidea Rubra, St. Hilaire. Red-flowered Almeidea (Bot. Mag. t. 4548).—Nat. Ord., Rutaceæ § Cusparieæ.—A handsome stove shrub, of branching habit, growing three to five feet high, and furnished with broadly lanceolate alternate petiolate leaves, which are acute at the base, acuminate at the apex, and entire on the margin. The flowers come in thyrsoid panicles, and consist of a short five-toothed calyx and five obovate-spathulate obtuse



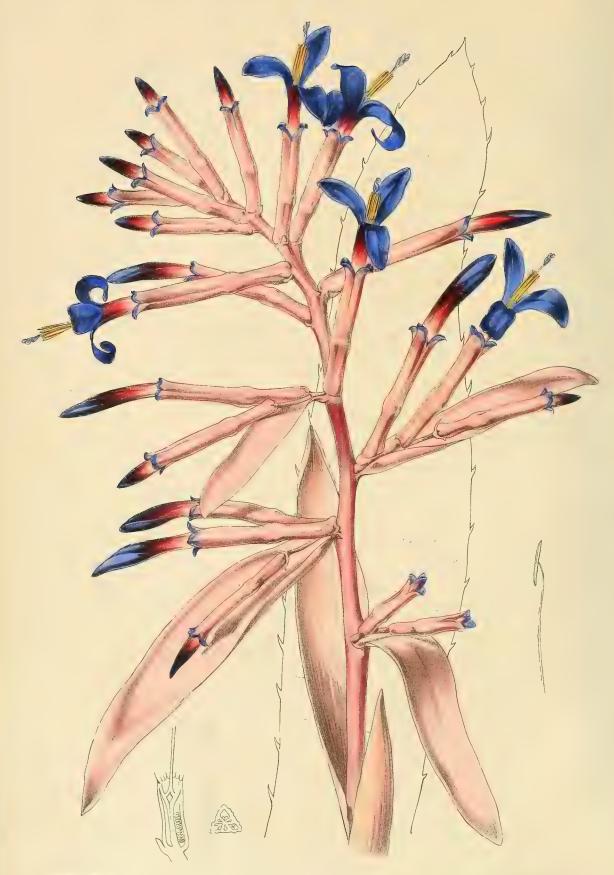
1. Almeidea rubra.
2. Potentilla ochreatu.
scabrous keel, triangular sepals of the same length yellow inside, and nearly circular petals of firm texture and a bright yellow colour. From the Himalayas. Introduced, about 1849, by Major Madden. Flowers in Septem-

ber. Glasnevin Botanic Garden, Dublin.

Flowers in Septem-

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Billbergia Morelliana

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### BILLBERGIA MORELLIANA.

Nat. Order. -- BROMELIACEE.

GENERIC CHARACTER.-Billbergia, Thunberg.-Perianth sixparted; the three outer calycine lobes equal, not keeled, erect or spirally convoluted, awned or unawned, obliquely dilated towards the right side at the summit; the inner corolline lobes much longer than the outer, spreading or erect at the apex, with scales or a double crest at the base within, rarely naked. Stamens six, epigynous; filaments filiform, three for the most part adherent to the interior lobes of the perianth; anthers ovate, affixed by the back, incumbent or almost erect. Ovary inferior, three-celled. Ovules numerous, pendulous from the inner angle of the cells, anatropous. Style filiform; stigmas three, petaloid, convoluted, or linear and crisped. Berry subglobose, three-celled. Seeds numerous, naked or appendaged. -Herbs of tropical America, very frequently pseudo-parasitic on the trunks of trees, with or without scapes; leaves ligulate, linear or ensiform, mostly spinulose-serrulate; flowers spiked, paniculate or racemosely paniculate, floral spathes sometimes wanting, sometimes small or large, coloured.—(Endlicher, Gen. Plant. 1302).

BILLBERGIA MORELLIANA. Morell's Billbergia. - Leaves strap-shaped, guttered at the lower part, rigid, the edges parallel, beset with thorn-like teeth pointing forward at intervals of one and a half to three quarters of an inch, the surface deep green with transverse bands of white, consisting of the scurflike deciduous outer layer of cuticle; scape elongated, panicled, with remote broadly ensiform spreading petaloid bracts, one at the base of each abbreviated branch of the panicle; flowers mostly crowded in threes at the axils of these large bracts, one almost sessile, the lowest with a single minute triangular bractlet, the others with a pair at the base of the ovary; calyx with the tube adherent and the free lobes erect, bluntly keeled, recurved at the apex, retusely emarginate and mucronate; petals strap-shaped below, elongate - spathulate above, quite free, spreading at the summit when in flower, otherwise rolled spirally over one another; filaments filiform, free, alternating with six minute obtuse membranous scales; anthers linear, almost versatile; ovary inferior, bluntly three-cornered, with three intermediate furrows, dilated above and below, truly three-celled, but with three small spurious cells in the imperfectly united dissepiments; ovules numerous, horizontal, in two rows in the inner angle of the cells, not quite reaching the top and bottom; style filiform; stigmas three, petaloid, falcate, spirally curled, a little longer than the stamens, shorter than the petals.

Syn.-Tillandsia Morelliana, of the French gardens.

ESCRIPTION.—This remarkably beautiful member of the Pine-Apple family bears leaves more than two feet in length, with a breadth of one and a half to two inches; they are hard and leathery, and concave on the upper face near their insertion, ribband-shaped, with parallel edges, beset at intervals of one and a half to three quarters of an inch, with thorn-like spines pointing forwards, the surfaces being dull dark green, barred above and below with transverse bands of white, consisting of the deciduous scurf occurring generally in this family; when these are rubbed off, the surface is shining. The flowering stalk is elongated and branched, bearing distant, alternate, somewhat sword-shaped petaloid bracts, mostly two to three inches long, and about three quarters broad in the greatest breadth; in the axils of these bracts arise branches bearing about three flowers, one nearly sessile, the others on short stalks, all divergent from the main stalk; the lowest flower has one, the others two minute triangular bractlets at the base of the ovary. Flowering stalks, bracts, and the tubes of the flowers, delicate reddish pink. Flowers large, two to two and a half inches long; the tube of the calyx adherent to the inferior ovary, bluntly three-cornered, with three deep grooves and several smaller ones, about six lines long, thickened above and below; the lobes of the calvx erect, bluntly keeled, about nine lines long, recurved at the summit, the point depressed backwards in a fold at the midnerve; the lower part of the calyx of the same colour as the stalks, the points of the lobes tinged with violet. Petals strap-shaped below, extending up into a spathulate spreading summit, about one and a half to two inches long, the upper part deep rich violet blue, shading into a more purplish tint, gradually fading out downwards. Filaments thread-like, pinkish white; anthers linear, orange-coloured; style thread-like, pale, terminating in three narrow siekleshaped spirally-wound blue petaloid stigmas.

History, &c.—The present plant is figured from a specimen in the nursery of Mr. E. G. Henderson of Wellington Road, St. John's Wood, who received it under the name of Tillandsia Morelliana, from the Continent. A Tillandsia it of course is not, inasmuch as it possesses a completely inferior ovary. Of the genera possessing that peculiarity it comes nearest to Billbergia, although it exhibits certain deviations from the character of that genus: in its keeled sepals, which are not obliquely dilated, its linear anthers (which are not well represented in our drawing), and in the elongated linear placentas bearing horizontal ovules. In the character of the perianth it approaches Disteganthus, but in most other respects differs. We have preferred leaving it as a Billbergia to making a new genus, which will be with more propriety left until the family receives a thorough revision.— $\Lambda$ . H.

CULTURE.—This singular and very elegant plant, like most of its congeners, does not produce roots very abundantly, and is consequently impatient of too much moisture. It succeeds best sus-

pended in a basket in an Orchid house, or the warmest and most humid part of the stove, and it should be planted in porous materials, such as sphagnum, peat-charcoal, and half decomposed leaves. Water at all times cautiously at the root, but in the growing season syringe lightly twice or thrice a day. Shade from bright light in the summer season. The temperature in the summer season should not fall below 60°, nor below 50° during the winter. The Billbergias are propagated by seed, but more frequently by division of the plants.—A.

# SUGGESTIONS FOR AN IMPROVED ROTATION IN VEGETABLE CULTURE.

By Mr. R. ERRINGTON, GARDENER TO SIR P. DE MALPAS G. EGERTON, BART., OULTON PARK, CHESHIRE.

MHAT the times we live in are notorious for progress, is a truism which needs no illustration; and amongst other horticultural matters, our old English kitchen gardening must needs come in for its share. Although, hitherto, our culinary crops, in the main, have been assigned to their respective positions, on the unsystematic ground of necessity, I see no reason why some attempt at generalization should not take place. Everything hitherto propounded as to rotations, appears too fragmentary, and isolate to deserve the name of system. And, for my own part, in attempting to throw an additional light on this interesting subject, I do not for a moment suppose that I can place the whole affair on a perfectly satisfactory basis. The utmost I aim at is, to offer hints—certainly the result of experience—which may assist some of the ardent minds of the rising generation of young gardeners, with whom, in combination with horticultural or agricultural chemists, the solution of the problem must rest.

I submit, then, that whatever be the soil or situation, the only way to approach the subject of rotation of crops in kitchen gardens, is by classifying the whole in such a way as that any one shall, at all times, not only be suited with the necessary conditions, but that it shall be decidedly instrumental in preparing the soil for its successors; and this with a minimum amount of labour and manure. It is well known to all practical men, what a difficulty exists in nearly all gardens, in obtaining the necessary change for the various members of the Brassica family; from some of which a garden is no part of the year totally free. All the Brocolies, the Cauliflowers, the Cabbages, the Savoys, Kales, Brussels' sprouts, &c., constitute such a large group, and follow in such quick succession, that unless special means are taken (based on some well digested system which may secure as far as art can do a rotation), the soil is never entirely free of the contamination arising from such vegetable debris. It is useless to term this case simply exhaustion: it is that, and something more. Were it mere exhaustion, we should at all times be able to get over the difficulty by extra manuring. I have known, however, numberless cases, in which all the manure in the compost-yard would not force a crop of good Brocoli; and that too on land which formerly yielded satisfactory crops. It is extremely probable that the failure is consequent merely on an abstraction of certain inorganic matters from the soil, by the Brassicas; and if so, Chemistry should be called to our aid, and by a severe analysis, at once determine the true position of the affair.

Whilst speaking of the Brassica family, I am tempted to observe, that I have not been able to ensure crops of Brocoli without the use of charred material. My practice is, to bore huge holes where the plants are to be inserted, with a very thick stake; and then to fill the holes with some of the burnt material which has cased over the charring heaps of brushwood, &c. Such I generally mix with a little maiden loam, and the hole being filled with this "priming," the plant is inserted in the midst, with the dibble; first dipping the roots in a mud of which soot forms the chief ingredient. By this plan, I can carry out Brassica culture; without it three cases in four will end in failure: for the gardens here are of about a century's standing, and the soil has become, what some persons would term, effete; we, nevertheless, contrive to produce plenty of fine vegetables.

Before proceeding further, it will be well to arrange our kitchen crops under four divisions:—

1. Deepeners and renewers. Asparagus, Sea-kale, Rhubarb, Horse-radish, Celery, &c.

2. Preparers. Potatocs, Carrots, Parsnips, Beet, Salsafy, and Scorzonera, Onions, Peas, Broad beans, &c.

3. Surface Crops. Spinach, Lettuce, Endive, Kidney beans, and the various border herbs; as Corn Salad, Chervil, Parsley, Rampion, Radishes, the various Cresses, &c.

4. Deteriorators. All the Brassicas.

Now this list, although not containing all the little matters which find a place in our kitchen gardens, is composed of the principal, and is sufficient for the end in view. It will be seen that I have left the bush fruit out of the question, although amongst the best of our vegetable improvers, for culinary crops. I cannot for a moment be a party towards a pell-mell admixture of bushes and

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vegetables. Again, one remark on the "deteriorators." I do not wish it to be inferred, that no other class deteriorates the soil; I merely point to these as the principal, and suggest that every scheme of rotation, to proceed on right principles, must take a thorough cognisance of this great fact. The mode of classification here adopted, will doubtless appear sufficiently arbitrary to some persons. It is, however, the most apt as to a practical application that I could conceive; and any further multiplication of classes would, I fear, destroy the simplicity of the scheme; for my object has been to keep the main features constantly before the eye of young or uninformed practitioners.

Before generalizing further, I must take the liberty of making a few collateral observations, and giving a few details of the course of practice I have pursued here for years, with regard to certain crops; and on which practices, or similar ones, I do think our general kitchen garden policy should be mainly based. This will prepare the inexperienced reader, for whom these remarks are intended, for an explanation of the reciprocity which should exist between the four divisions already enumerated.

In the first place, then, I must point to Celery culture; this is a well-known enricher, and with us the best "deepener" of the No. 1 section. We grow it entirely on the Scotch or bed system. I never plant any in single drills. Our circumstances are such, and our demand for vegetables so constant, and I may add considerable, that I am obliged to take one substantial crop from the ground intended for the Celery crops, in the spring and summer previous. The ground we select for the Celery beds, generally belongs to the No. 4 section, or deteriorated soil; that is to say, land which has had rather too much of the Brassica tribes—both deteriorated in character and exhausted in point of quality. We manage to grow nearly all the summer Peas, previous to the introduction of the Celery, on the same plots; and the Celery being planted in beds about six feet wide, very deep culture becomes necessary between the respective beds; so deep, that we invariably bring up a portion of the subsoil. Now, this is accounted bad practice by some. I, however, desire to do so, feeling assured that it is in degree a renovating process, inasmuch as fresh inorganic matters are thereby brought to the surface. And it proves good practice, as shown by the results; for the benefits to succeeding crops in the Brassica way has ever been sufficiently manifested.

Next in course, may be named Asparagus: this again is a most capital agent as "deepener" and "renovator." In forcing Asparagus my practice is (using the old dung-bed plan,) to force some of the best in the garden. The old plan of depending on exhausted beds for winter Asparagus, I entirely repudiate. I never have exhausted beds. I do not suffer Asparagus to remain long enough on the ground. It becomes necessary, therefore, to plant at least as much annually as we force; and this we find a simple, economical, and most easy plan; notwithstanding all the hubbub about loss in the destruction of roots, &c., generally made by parties who see things by halves, or by fractional parts.

As forming part of a system—a whole which every gardener of extensive experience is bound to aim at—the practice is undeniable: let those, however, who will judge the practice in an isolated way, show forth at the same time a well digested scheme for a complete rotation of crops in our kitchen gardens; for these things may not be disposed of but in connection. My practice is, to make a Celery bed or beds play jackal to the lion Asparagus. Wherever the future year's beds of Asparagus are to be planted, there we are sure to have beds of Celery in the autumn preceding; and, in preparing them, we trench much deeper than usual, and introduce a very considerable amount of weeds, leaves, and other refuse vegetable matter in the bottom of the trench, say below two feet. It will be seen, of course, that in this case, a No. 1 is made to prepare for another No. 1—that is, the class "deepeners." This, then, I feel bound to point to as one of those exceptions from which no rule is entirely free.

In Sea-kale again—as part of a system—is another "deepener" of some importance. Many there be that force their Sea-kale by the old blanching-pot mode, on the spot where it is cultivated. I freely confess that I never pass by a plot of this kind, in these days, without feeling a secret pity for those who have to depend on so unsystematic, precarious, and expensive a process; considering how much more economical it is to take up the roots and to force them in a narrow compass, where one tithe of the labour and fermenting material would suffice. Even Mr. Barnes of Bicton, (who has doubtless proved himself a first-rate judge of such matters), until the last two or three years was wont to give very explicit directions for the pot-forcing of this root: of late, however, I perceive that he manifests a decided bias to the course here suggested. We sow a little Sea-kale annually in drills; we transplant an average amount annually, and in a similar ratio, which indeed dictates the extent of transplanting: we force a bed or beds, grown up to the very highest perfection, which with us they do in the second year. Through all the stages of Sea-kale, then, we have a plant, the culture of which, rightly conducted, places it at once in the No. 1 section.

Rhubarb we grow precisely on the same principle as the Sea-kale, and force it in a similar way. It is moreover sown, transplanted, &c., in like manner, and stands about the same time on the ground.

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Here is another "deepener" and renovator of the class No. 1, for we have to trench nearly a yard deep in order to get up the roots for forcing or otherwise.

Enough of the class "deepeners." I must now advert to a few features in the class, "preparers." It may be well here to begin with the fusiform class, as our botanists term them; such as the Carrot, the Parsnip, the Beet, &c., &c. These, it is well known, delight in a deep and mellow soil; therefore the "deepeners" are a class well adapted to pave the way for them. I do not say that such must follow the deepeners; I only urge that if any ground of that character is available, it will be thus well applied. I need do no more here than merely point to them; they are, however, of considerable importance in an estimate; forming altogether a valuable group. This class not only prefers a deep soil, but also a soil possessing much quality; not in the shape of raw manures, but rather the remains of former manurings; in fact, rich in humus. Deep trenching or digging is generally practised with this class; and a good practice it is: if, however, we can find a scheme which shall at once suit the existing crop, and pave the way to a succeeding crop or crops, a great point is gained as to manual labour; and this is one of those very material affairs which it is the design of the present paper to throw light on.

We come now to No. 3, "surface crops;" and here, a very few remarks will suffice to show their position in the scheme. These are, of course, at once subsidiary and subordinate to the general scheme; they are *followers* not *leaders*; and, as to soil, quite of second-rate consideration. Indeed, we grow most of these things in marginal borders; they are not, however, strictly confined to such, but will follow anywhere, if a fine tilth can be ensured.

And now for the 4th class, termed "deteriorators," which, for the sake of the present argument, may be confined to the Brassica tribes in general; not that they alone deserve the title, but that they constitute the main feature. Depth they like, and a rich soil; but, as has already been shown, they require also something more on old and hard-worked soils. Everybody has heard of the club, and of the disease termed "fingers and toes;" and serious evils they are, indeed, to grapple with on old soils.

It will now be readily seen, that one class, termed "deepeners," constitutes the keystone of the arch; and that it is really no good policy to continue a bed of Asparagus, or Sea-kale, for a score of years on the same plot, as though its culture was to form an abstracted proposition in itself. I have long since proved that such should form part of a system which has for its basis a kind of reciprocity, which, without being biased by cultural matters of an isolated character, shall render any given crop a preparer for the succeeding one.

To take an abstracted glance, then, at what has been said, and to deduce a few leading maxims applicable in a majority of cases, I would say, let most of the ground recently occupied by the class termed "deepeners and renewers" be occupied by the principal crops of Brocoli, and winter greens of various kinds; and if any surplus remain, it is extremely well adapted for the Carrots, Parsnips, Onions, &c. Such land requires, of course, no manure, and those whose soil proves inapt to the culture of such uncertain crops in old kitchen gardens, as the Carrot and Onion, will find such soil much less given to the grub than if fresh manured.

The Celery beds, already alluded to, will be in order for Asparagus planting without any further digging or manuring; providing the man who takes it up makes a point of throwing the soil in a high ridge as he proceeds. This is our practice, and I may add, that I apply an extra amount of manure to the Celery beds, or beds intended for the new Asparagus plantation; and, as before observed, burying much raw vegetable matter—weeds, leaves, coarse manure, &c.—at the bottom, and then forking in a good dressing of old manure near the surface. This, of course, produces very fine, and very crisp and tender Celery; and ensures a good bottom for the Asparagus. If any Celery ground remain unoccupied my practice is to transplant the Sea-kale, Rhubarb, &c., on to it, for which it is in a state of high preparation, merely levelling down the ridges. Of course, I need hardly observe, that such soil is admirably adapted also for Cauliflowers.

Our general scheme, therefore, stands nearly in this way; supposing a garden about equally divided in four parcels:—

Deepeners, followed by Deteriorators, or the Brassica family:—no manure.

Deteriorators, followed by Improvers:—manure.

Improvers, followed by Surface crops: --- manure where necessary.

Surface crops, followed by Deepeners:—soil again renewed.

The main basis of the scheme rests on the fully recognized necessity of providing a fresh plot annually for the class "deteriorators;" and this agrees admirably with the improved modes of obtaining Asparagus and Sea-kale, as also the greatest amount of good Celery from a given space. The covering of Celery, too, during severe frosts, is a matter of great import in the calculation. I have

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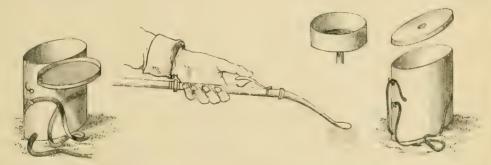
found by experience, that it requires nearly as much straw or litter to cover a single trench, as a whole bed. As for the argument of destroying the roots of Asparagus in the act of forcing, it is not worth a straw, and used only by those who cannot comprehend a system, which is based on broad views of kitchen gardening. Two ounces of Asparagus seed, value eighteen-pence, sown every March, will supply the largest garden in the kingdom.

### GARDEN UTENSILS,---THE WATERING CAN.

By Mr. P. F. KEIR.

MHE desirability of obviating manual labour will always be greater or less according to the interests of those concerned in the consideration of such a subject. But all will readily allow that the less oppressive and irksome it is made, the more readily it will be undergone; and therefore, whatever has a tendency to promote this object, however humble in its construction, ought to be favourably received and made available. The Schnellgiesser (noticed and illustrated at vol. ii., p. 221), has at least the merit of being novel, and for the purpose of watering collections of plants out of doors during the summer months, it has one or two desirable features. It is evidently fitted to render the work of watering lighter than the common practice of carrying the water in cans or pots by hand; and also to save much of the walking to and from the pump or well, in order to obtain a fresh supply. From the representation, however, it appears that the top of the tub is left quite open, and the water is thus likely to splash about inconveniently. This, though a serious objection to the contrivance, may be easily removed by the vessel being made in a different manner. In the first place, lightness is of much importance, and on this score I can perceive no strong reason for preferring wood to the material of which the common garden can is made.

To be much more lasting than tinned plate, the wood of which the vessel is made must be hard and consequently heavy; it is therefore not to be recommended. With regard to the form of the vessel, I think the ordinary botanical specimen box suggests what is most suitable for the back of the workman. It may indeed be also flat, as well as convex on one side; but a round form such as that of a tub appears the most unsuitable of all. The most objectionable feature of the contrivance is undoubtedly the open top, which admits of the water being splashed about while the workman is carrying his burden, especially when the tub is full. It is particularly necessary to repair this defect by means of a lid made so as to admit of being opened while the vessel is being replenished, and afterwards shut down quite close. Except in cases of carelessness, the evil in question would thus be prevented. The annexed figure will convey some idea of the sort of vessel alluded to. But the best plan of all would be to have the cover made to serew on tightly, and never taken off except for the purpose of cleaning the vessel, which, in this case could be filled by means of a large funnel fixed in a bung-hole made in the cover. The form of this funnel may be shown thus:—The straps, which may be made to lie



over the breast or the shoulders, as shown in the cut referred to, should pass round the vessel and through a handle at each side, as in the present figure; and a hook should also be fixed near the top on which to hang the hose when convenient. Indeed, if this contrivance is to be made to save more than half of the labour and time usually expended in watering, it must contain a corresponding quantity of water; and when a man has a heavy burden on his back he cannot be expected to stand erect. So that, viewed in this light, the screw-top or cover becomes indispensable.

With regard to the turncock, the sketch above will suggest a form of constructing this part of the Schnellgiesser, so as to be more readily at the command of the workman. There is also no necessity

for a second person to pump the water, supposing the pump to be the source of supply; for the vessel may be placed on a stand or stool at any convenient height, and the person who carries it can thus fill it readily. Very often the supply is obtained from a tank, and in this case the vessel might be placed on a stand, and filled by means of a common pot or bucket. After all that can be said in favour of this novelty, the quantity of water which a man can carry on his back for any length of time is not very great; and though the invention seems to have been suggested with a view to dispatch, it is only adapted for certain circumstances. Where there is a great deal of watering, and the distance of carriage long, nothing yet noticed is so convenient and effective as an oval tub, capable of containing from twenty to thirty gallons, and mounted on wheels. This can be conveyed to any distance with ease, and the water supplied to the plants by means of the common pot. For lighter work, the Schnellgiesser, with the improvements here suggested, is perhaps preferable.

# NOTES, CULTURAL, CRITICAL, AND SUGGESTIVE.

NDER this head we propose, from time to time, to string together such short paragraphs as may suggest themselves to our regular contributors, or to ourselves, and to answer such questions from correspondents as may be deemed too important for the cover of the Magazine. All queries not answered by ourselves, will be placed in the hands of such of our contributors as we know to be competent to the task, and thus we hope to produce a page or two of varied and interesting information. Those culturists, also, who have not the faculty of elaborating articles for the press, will here find a place for their short communications, and such contributions, whether critical or otherwise, will always be acceptable to us.

The Crystal Palace.—Taste is a jade so fickle and inconstant, more especially in this country among we common work-a-day people, that it is not right to expect us to decide the question between Mr. Owen Jones and Mr. Sang, the decorative artists; but still, we can have no hesitation in asserting, that if the matter of painting and decoration had been left entirely to Mr. Paxton and the contractors, they would very likely have produced a more satisfactory result than is likely to emanate from the cogitations of Mr. Owen Jones. The mistake which this gentleman appears to have fallen into, is that of treating a building with a transparent roof, and to appearance of the most insecure and fragile character, the same as he would a Cathedral with massive architectural proportions, stained windows, and subdued lights. And he also seems to have forgotten that the productions to be exhibited will, to a considerable extent, be of a very gaudy character: such as the silks of Cashmere, India, China, France, and our own country; the coarser fabrics of Kidderminster, Manchester, and other towns; the porcelain and china of Dresden and Staffordshire; the varied specimens of papier-machée, cabinet, and fancy stationery work, to say nothing of the sculptuary; and when we consider the varied tints and gay colours thus brought together, it does appear absurd to make the interior of the building as gaudy as Mr. Jones proposes to do, for certainly a quiet tint to relieve the eye would be much more appropriate.

Every person who has paid any attention to decorative gardening is aware that a flower-garden, upon warm gravel, filled with gay and principally warm-coloured flowers, has in bright light an effect anything but satisfactory upon the organ of vision; but if the same colours are interspersed with grass, we can look upon them with satisfaction and delight. The same rule will apply to the decoration of the Exhibition building; the things exhibited will present colour enough; therefore the more quiet the colour of the building the better. Green bronze, as suggested by Mr. Sang, for the iron work, is certainly preferable to the jimcrackery and barber's-poles recommended by Mr. Jones; and perhaps white, with a slight tint of blue in it, would be the most appropriate for the wood work. The building itself is quite light enough; and to render it to appearance still more slight by the introduction of light and gay colours, will be, in our opinion, the height of bad taste.

Cleanliness among Plants.—The doctrine is a singular one, and perfectly true, but still our contemporary need not have consulted French authors for a confirmation of an opinion as old as the hills to practical men. Those who supply the Exhibition tables at Chiswick are well acquainted with the importance of washing plants, and the enveloping of orange-trees in a foam of soft soap, to destroy insects and clean the foliage and wood: they were among the first operations of our apprentice days. Frequently have we advised amateurs, when they get plants from the smoke-stifled London nurseries, to subject them, as a starting point in good cultivation, to a thorough washing, to lay them on their sides, and to syringe them with lukewarm water until the stem and foliage is perfectly clean. Such an operation clears the pores of the plants, promotes perspiration, and consequently adds to the health of the plants. How far the Chancellor of the Exchequer may be inclined to repeal the soap

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duty for the benefit of the garment—the fig-leaves of our first parents, and the first gardeners—we do not know; but perhaps the fig-leaf argument is as far fetched as any that is likely to be urged against the impost. Let us, however, caution gardeners against being too lavish in the use of soap, or possibly they may have to resort to restoratives, as well as cleansers, in the management of plants; for soft soap is certain death to the tender foliage of most plants. We lately saw some specimens of Ixora quite dead from the effects of soap-suds upon the roots of the plants. If soap is used, it must either be while the plants are in a dormant state, or it must be washed off before it has time to dry upon the young foliage.—W.

### PROGRESS OF HORTICULTURE, &c.

GCATTERED through the horticultural press many facts, scientific, cultural, or otherwise interesting, frequently present themselves; and though considered important for the time, soon pass from the mind and are forgotten, until accident again brings the reader in contact with them. Useful hints also appear in various places, but gardening periodicals are now so numerous, that few have the means to procure them all; and hence suggestions frequently of great importance escape the notice of those practical men who by experiment would best test their value; and hence too, facts of great importance are forgotten for want of timely appreciation. To remedy this state of things, and also to render our journal a complete register of progress, we intend from time to time to give short abstracts of such novel or interesting papers as may appear in the pages of our contemporaries, and thus render this *Magazine* what it ought to be—a complete register and index of progress; and to render the excerpts complete, the name of the journal, and the page from which they are taken, will be given with each paragraph as a guide to further research.

Pomeranian Cabbage.—Remarkable for its conical tapering form, very compact and firm to the apex. It is very hardy, and likely to prove valuable in situations too cold for the Battersea and other

Cabbages, grown in the neighbourhood of London.—Jour. Hort. Soc., vol. 5, p. 280.

Haricot d'Algiers.—A Runner Bean, from Lorraine, remarkable for its pale colour; and the pods being entirely destitute of any lining, they are exceedingly tender and excellent when cooked. Its pale colour renders it unattractive, but when known it will be esteemed for private gardens, though not suitable for market purposes.—Ibid. p. 281.

Early Peas.—Essex Champion, Warner's Early Emperor, Warner's Early Conqueror, Early Bedalean, Early Railway, and Early Wonder may be considered identical. Warner's Early Emperor is stronger and taller than the Early Kent; not quite so early, but a few days earlier than the Early May. Daneeroft Rival, Daneeroft Early Green, Farnes's Conservative Green Marrow, and the

Transparent Pea are the same.—Ibid. p. 282.

Late Peas.—Of fifteen varieties (so called by the seedsmen) the following appear to be the best, as proved in the Horticultural Society's Garden:—American Dwarf, sown April 6, fit for use July 8th; about one and a half foot high, a good bearer, ripening about ten days later than Bishop's Long Pod. Stubb's or Burbidge's Eclipse, sown April 6th, fit for use July 12; a good dwarf for its season, having the peas larger than any other variety equally dwarf. Hunter's New Marrow, sown April 6th, fit for use July 18th; larger than Knight's Dwarf Marrow, and of very sugary quality; a good bearer.—Ibid. p. 282-3. Hairs' Dwarf Green Mammoth Marrow, two and a half feet high, sown March 11th, in full flower June 24th; six peas in a pod of large size and full flavour; first gathering July 10th, the most prolific and best.—N. B. Jour. of Hort., p. 41.

Cauliflowers were sown on April 9th, and subsequently treated alike in every respect. Of the eight kinds tried, the large Asiatic and the Walcheren proved to be those most deserving of cultivation. It must here be remarked, that April 9th is much too late to sow Cauliflowers to prove in this country; for every gardener knows that a kind that comes good in spring may be almost worthless in a dry hot summer. The early varieties were failures; but the late kinds were good. In experiments upon vegetables, it is important that they should be proved in the best season for their growth.---Jour. Hort.

Soc. v. 5, p. 24.

Summer Lettuces.—White Paris Cos: Of all the varieties of summer Cos Lettuces, this was the largest, the best, and the largest in running to seed; it was sown April 10th, and had not commenced to run July 27th, when the other Cos Lettuces sown on the same day were running to flower. Malta, sown April 10th; it was only running partially July 27th. A good Cabbage Lettuce, larger than the Neapolitan; leaves dentate, their margins not curled.—Ibid., p. 26.

Neapolitan Cabbage Lettuce.—Sown April 10th; still remained in the Cabbage form without running July 27th. Compact, finely blanched, crisp, and tender; leaves having the margins dentate, a

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little curled. As in the last season, so in this, it has proved the best Cabbage Lettuce. From the above detail it appears that the above are the best summer Lettuces, and that various others reputed new and good, are not deserving of cultivation.—Ibid. p. 26.

The Barker Nectarine, when first introduced from Mr. Barker of Suedia, was noted as producing leaves with globose glands, large flowers, and peaches of little merit. Subsequently, one small twig was observed having reniform glands. Buds from this were taken and worked on a tree against the south wall, and the fruit proves to be the Nectarine. Leaves with reniform glands; flowers small; fruit large obovate, dark red next the sun; pale yellowish green where shaded. Flesh fine, yellowish white, rayed with bright red at the stone, from which it parts freely; rich in this unfavourable season (1850); but scarcely so aromatic as the Violette Hâtive. Stone larger than that of the sort just mentioned, flattish, obovate. Kernel bitter. This variety is quite distinct from the Stanwick Nectarine, originally obtained from the same gentleman, the one having a sweet, the other a bitter kernel.—Ibid. p. 25.

Walburton Admirable Peach.—Raised near Arundel, Sussex, and supposed to be a seedling from the Noblesse, which it much resembles, but is more valuable in quality, in consequence of its ripening from three weeks to a month later, or about the same time as the late Admirable Peach. Flesh melting, parting freely from the stone; leaves serrated, glandless. Ripe and in fine perfection this season (1850), the first week in October.—Rivers in Florist, p. 11.

Strawberries. — Of these, Keen's Seedling, Princess Alice Maud, British Queen, Old Pine, Comte de Paris, and Elton, are recommended as the best by Mr. Whiting; and Black Prince, Wilmot's Prince Arthur, Kitley's Goliah, and Myatt's Surprise, as being worth a trial.—Florist, p. 9.

Market Gardening.—The land can well sustain so much cropping, on account of the heavy dungings, trenchings, and hoeings which it receives. If you ask a market gardener what is to succeed this or that crop, the answer is "Don't know; it depends upon what is ready for planting." Continued trenching two spades deep seems expensive; but market gardeners know that after an active crop the top soil for several inches is quite exhausted, and hence the reason for continued trenching to bring up the top soil that but a few months before had been turned down, with a large proportion of dung to emrich it, and fit it for active use along with the half decayed manure. The labourers employed on 150 acres are seventy during winter, and in summer about one hundred and fifty. The cost per acre is from £9 to £10; the tithes being 10s. to 12s. per acre. Some idea of the amount of labour consumed on small matters will be conceived when I state that the whole of the frames, amounting to one thousand lights, and the hand-glasses to four thousand, are repaired every autumn.—(Gard. Chron., p. 4.)

Dickson's Emperor Apple.—Size large, form irregular, slightly ribbed, colour yellow, with dashes of carmine red interspersed, as well as with numerous minute specks of yellowish straw colour; the side most exposed to the sun coloured with a rich reddish brick colour; stalk unusually short for so large a fruit, indicating that it will not be liable to be blown from the tree by the wind, an important merit; eye very large, irregular, and very deeply sunk, cavity for seeds small; flesh yellowish white, juicy; flavour excellent, keeps till January; bears abundantly as a standard, and is certainly one of the very best apples in existence. It was raised at Seacliffe Gardens, near Prestonkirk, Scotland, by Mr. Arthur Calder, the gardener there.—N. B. Jour. of Hort., p. 27.

Grafting Cacti.—Mr. J. C. Bidwell, of Tinana, New South Wales, recommends Cereus triangularis as being a superior stock for grafting the trailing kinds upon. He states it will bear great heat, considerable coolness, any amount of wet above ground, and in rich soil will make a shoot six feet from a cutting of six inches in one season. "My advice to gardeners in England who wish to procure gigantic specimens of slow-growing Cacti in a short space of time, is to procure plants of C. triangularis, plant them in any rich soil, give them plenty of heat and water; when high enough, stop the shoots, in order to make the angles thicker, and graft at a time when the stock is attempting vigorously to sprout at every eye. A graft of C. Mallisonii, three inches long, six months after, has seventeen shoots all pushing at the tips: eight of the largest are twelve to fifteen inches long, and none of the rest less than six inches." The original plant of C. Mallisoni, growing in the same place in the same time, barely replaced the shoot taken off to graft.—Gard. Chron., p. 22.

Oxalis Bowei, in the open garden. "The earth was removed to the depth of two feet; I then introduced eight inches of drainage, laying on the top of it a layer of fresh turf, with the view of preventing the soil falling into the interstices. I then filled up the bed with equal parts of well-rolled turfy loam and leaf-mould intimately mixed together. In May I turned out the plants, and placed them so that the bulbs might be three inches below the surface. Thus circumstanced, I have never found them to receive any injury, with the exception of the foliage being destroyed by frost. They flower beautifully every autumn."—Ibid. p. 39.





Miltonia spectabilis var. Morellians

### MILTONIA SPECTABILIS, VAR. MORELLIANA.

Nat. Order, ORCHIDACE,E.

GENERIC CHARACTER. - Miltonia, Lindley .- Perigone with sessile, spreading segments, the outer lateral, of the same form as the inner, revolute, connate at the base. Labellum very large, dilated, undivided, sessile, slightly adherent to the column, lamellated at the base. Column short, semi-terete, auriculate at the apex; pollen-masses two, adherent to an oblong caudicle.-Brazilian herbs; epiphytic, pseudo-bulbous; scape one-flowered, sheathed; scales equitant, flowers very showy .-(Endlicher, Gen. Plant. supp. i., 1467-1).

Miltonia spectabilis, Lindley.—Pseudo-bulbs oval, compressed, smooth; leaves ligulate, spreading very much; peduncles one-flowered; scales large, striated, imbricated, keeled; sepals oval, flat; petals uniform with the sepals, revolute; labellum very large, rounded wedge-shaped, with three lamellæ at the base; column with very acute narrow wings,

Var. Morelliana .- Morell's Miltonia .- Sepals and petals violet purple, the labellum lilac rose with deeper veins, not

nearly so strongly marked as in the type.

ESCRIPTION.—This plant has a sort of creeping rhizome, sheathed with scales and sending out rather slender roots helper and the sending out rather slender roots below, and pseudo-bulbs, distant from each other, above. pseudo-bulbs are oblong, compressed smooth, with two large membranous scales, one on each side at the base. Leaves two, sessile on the pseudo-bulb and terminating it, ligulate, subcoriaceous, awned downward. Scape from the base of the pseudo-bulb, sheathed at the joints, with compressed equitant green membranous scales, and bearing a solitary large flower. Sepals and petals nearly alike, all spreading, or more or less revolute, oblong, obtuse, slightly waved, of a rich violet purple colour. Lip very large, pendant, obovate, subunguiculated, waved, longitudinally plaited and obscurely obliquely veined, terminating at the base in a short claw, and having three distinct lamellee, of a light rosy lilac colour, marked near the base with deeper veins. Column small, greenish; anther-case conico-hemispherical. Pollen-masses two.

HISTORY, &c.—This plant, which was introduced from South America by M. Morell, of Paris, was obtained from the continental gardens by Messrs. Knight and Perry, under the name of Miltonia Morelliana. There does not seem to be sufficient ground for separating it specifically from M. spectabilis, of which we already know two such differently coloured forms. In the original type of M. spectabilis the petals are almost white, and the lip much more deeply coloured; in the variety purpureo-corulea, figured by Sir W. J. Hooker, in the Botanical Magazine, the sepals and petals are deep purple, while the lip is pale. In the present form the sepals and petals are also all uniformly dark, but the lip is of a different colour, and the veinings, so distinct in the type, are only well marked in the lower part; it is also without the yellow colour of the column and of the lamellæ of the lip. The bracts appear to be more green than in the other forms, in which they are represented as fuscous or yellowish. Our figure was made from a plant which bloomed in the Exotic Nursery, Chelsea, in November last.—A. H.

CULTURE.—The Miltonias require the hot part of the Orchid house. They should be potted in light turfy peat raised an inch or two above the rim of the shallow pots, so as to allow the creeping stems to spread freely over and root into the soil; in order to assist them in this, they may be fixed down with hooked pegs. Like most of the race to which it belongs, it should have a moderate degree of shade in summer during bright sunshine.

### THEORY AND PRACTICE OF PRUNING.

By Mr. H. BAILEY, GARDENER TO G. HARCOURT, ESQ., M. P., NUNEHAM PARK, OXFORD.

THE GRAPE-VINE.

F all the fruits we cultivate, the Vine claims precedence, whether we consider the wholesome quality of the wholesome quality of its produce, or its importance in wine making; the interest which has ever been attached to it from the remotest ages of the world, or the gratification it affords to every man " to sit under the shade of his vine or his fig-tree." If proof of the mutability of our English climate were wanting, the existence of vineyards in many parts of the country formerly, would go to prove it; for in these very localities, in the present day, grapes do not ripen in one season out of three with certainty. In the old town of Abingdon (near this place), formerly written Abbey Town, there existed a large abbey, and as the ecclesiastics of old did not neglect to provide things temporal as well as spiritual, there was attached to it a vineyard. But such an experiment would vol. iii.



not succeed now. The culture of the Vine in the open air cannot now (unless in our southern counties), be depended upon, and those who do not wish for sour grapes, had better not attempt it.

The remarks which follow upon pruning will apply with equal bearing upon in-door and external cultivation.

Vines are generally raised from small cuttings with one bud and a little piece of last year's wood attached to it, (Fig. 1). Sometimes they are raised from layers, but this is an obsolete mode. The cutting being placed in a small pot in a genial heat, soon emits roots, and after receiving the necessary shifting and attention during one season, becomes

a young Vine (Fig. 2).

Our young plant has now arrived at the state in which it would be offered for sale in the nurseries, and we will suppose that the requisite number and proper selection of Vines for either a house or a wall has been made. Whatever the season of planting may be, the young Vine must be cut back to two or three of its lowest buds, for the purpose of concentrating its energies, and in order that the sap which would have nourished an indefinite number of weak shoots, may produce only one vigorous growth. If all other circumstances are favourable, the Vine will reach the top of the house the same year. It is then time to decide whether a separate vine shall be trained to every rafter, or whether one vine shall fill a portion or the whole of any allotted space. If it is wished to have several bearing stems to a single plant, the vine must be again cut down to two eyes, about eighteen inches in height, and the shoots which grow trained horizontally right and left; these are intended to form the main branches from which other shoots will be trained perpendicularly, as in Fig. 3. distance at which the perpendicular shoots may be, must be regulated by thinning the buds

on the shoot a at discretion. We will now suppose that each bud has made a vigorous shoot in the third year from planting, the Vine will have its full figure, and fruit will be expected.

The fruit of the Vine being produced from the wood of

the second season, it becomes Fig. 5. necessary now to decide in what way that wood is to be produced so as to furnish an annual supply of fruit-

bearing shoots. If all the eyes produced on the growing shoots were allowed to break, there would be a crowding and confusion of foliage, and too many bunches of grapes would be produced. Now, as it is better to prevent a waste of the sap, than to remove either too many leaves or bunches after their production, the eyes must be thinned, if short-jointed wood, taking out two and leaving two (Fig. 4). This will leave the buds which are to form the future spurs upon alternate sides of the main stem, (Fig. 5). When the Vine again makes shoots, one or more bunches of grapes will appear at the third or fourth joint of young growth, which must be reduced to one only, and the young shoot beyond it stopped with the finger and thumb—thereby only allowing as much foliage as can be fully exposed to the light; this stopping will cause other shoots to push from the axils of the leaves of the first shoot, which must not be removed, but stopped again at one joint from their origin; were they taken away entirely, it would have the effect of bursting the buds on the shoots which are to form the next year's spur.

We will now suppose that a young shoot of the previous year has produced fruit for the first time during the past year, the shoots on which the fruit was borne, diverging at nearly right angles from

the stem. They will now form what are technically called spurs, and are to be shortened back to within one or two eyes of their base. In addition to the buds formed on the

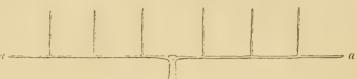


Fig. 3.

young wood, adventitious ones sometimes push from the base of the old spurs; these, if well placed, must be carefully retained in order to keep the spurs "at home," and prevent them becoming unsightly objects. Such is the mode in which what is called the spurring system is managed, although some cultivators prune the spurs off close to the stems of the Vinc, and the crop is produced from buds which push out from the naked stems. This can only be applied to Vines of great vigour.

The fruit of the Vine being produced by the wood of the previous year, there is another mode of procuring it, which is much practised also. It is called the long-rod system, and consists in having an annual supply of young canes from bottom to top of the house or wall. These have their buds thinned, as has already been described, but after producing fruit they are cut away, to be replaced by other shoots from the base. This system is more favourable to the production of fine grapes with the Muscat kinds, and the Dutch Hamburgh succeeds better so than by spurring. If large bunches are desired this is the way to get them; but for grapes for market there is no better system than by spurring, the object being to obtain medium sized compact bunches, with perfect berries, of large size and good colour.

There is a pruning of another kind—the thinning the berries. The skilful performance of this is of much importance, and the sooner it is done after the formation of them the better. The operator should be provided with a pair of fine-pointed sharp seissors, and should wear a thin, clean, and soft glove, to prevent the perspiration of his hands coming in contact with the tender skin; his head should also be covered with a silk handkerchief, to prevent injury from contact with the hair. Too much care cannot be taken in the performance of this work. The thinning must be accomplished gradually, say at two or three times, taking care always to leave the most prominent berries, and to give greater space to the larger growing kinds. Frontignans and Muscadines, with Black Prince grapes, are not improved beyond a certain medium of thinning the berries, and care must be exercised not to destroy the compactness of the bunch by immoderate use of the seissors.

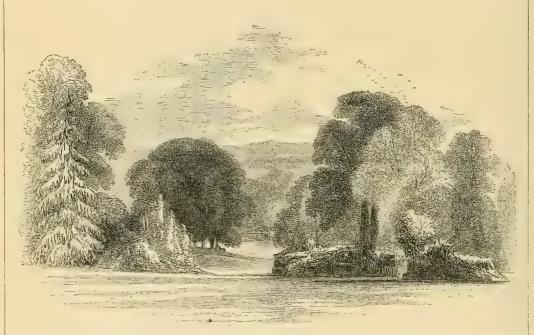
Early pruning is most desirable, nay, essential, for the Vine: it should be done as soon as the leaves fall, for this reason, that the roots are slowly accumulating sap during the period of repose, the whole of which is intended to support the buds in their young state; and of course the fewer they are in number the more vigour they must possess. The Vine, too, of all trees is least calculated to endure the evils of late pruning, and when this occurs it always bleeds, by which is meant that the sap exudes in copious quantities from the orifices of its channels, which have not the power of collapsing. The effects of losing a large quantity of this fluid just at the time it is most required, is to induce debility, and in extreme cases death. Various nostrums have been recommended as cures for bleeding, but it is best to prevent its occurrence. We say, therefore, prune early: or, as this term may apply differently to early forced or late Vines, prune as soon as they are at rest.

# VISITS TO REMARKABLE GARDENS.

REDLEAF-W. WELLS, Esq.

TITE concluded our last account of this admirable place, vol. ii., p. 164, with a notice of the English garden. We shall now step a few yards further through the shrubs and we are upon the Rocky Lawn, which is so unlike anything of the kind we ever saw elsewhere, that we doubt our power to convey a correct idea of its characteristics. Standing at the garden front of the house, at the part represented in the engraving (p. 45), nothing of unusual character presents itself, more than a beautifully wooded country, a smooth and polished lawn, and some fine specimens of choice trees and shrubs. But for these and the ugly iron fence intervening between the park and the lawn, the latter might be taken for a better kept part of the park, so little are the remarkable beauties of the place to be seen until you are actually in the midst of them. And here the difficulty of introducing flowers and decorative objects into the very centre of the foreground, is got rid of in a manner highly interesting and artistic, but only attainable in situations where the ground has a considerable fall, and where there is the refined taste and artistic eye of a connoisseur in the fine arts like Mr. Wells, to direct the operations. As we have before remarked, the rockwork at Redleaf is natural: that is, the substratum is stone—the Kentish sand-stone, in some places jutting completely out of the ground, and in almost every part of the pleasure grounds lying so near the surface as to require but very little labour to expose it to view. Hence the formation of rock scenery was a simple matter as to procuring material, yet requiring considerable taste in the disposal of the material when procured; but on this subject we shall speak more fully when writing of the "rocky garden."

The view below is taken from that part of the grounds where the visitor emerges from the English



garden to the lawn, and near to the site of that "living fountain," the Cedrus Deodara, shown at the extreme left of the engraving. The view is down the lawn to a small lake, with its rustic bridge at the bottom, a pretty placid scene—richly wooded, with fine groups of American and other shrubs, with huge pieces of stone jutting out here and there from beneath their branches, and some superb specimens of the rarer kinds of Conifers, at least those kinds which were rare at the time when these trees, which are the largest in the country, were planted, and which even at the present time are by no means common. Here is a huge specimen of Pinus ponderosa, the largest in England, and a noble tree; Pinus Lambertiana, a splendid plant, but too loose and sticky in character to make a gardenesque specimen; and some exquisite specimens of Abies Morinda, which at the time of our visit had made about three inches of their new growth, and presented then certainly the most exquisite picture of evergreen completeness we ever beheld. We never saw trees half so elegant: even the Deodar sinks in our

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1 man 1

estimation into insignificance beside them. What makes this tree so beautiful at this particular stage of its growth, is the contrast between the rich varnished pale green appearance of the young pendent shoots, as contrasted with the glaucous hue of the mature foliage; and this is so remarkable and striking that, at a distance, with the sun shining upon the plants, they had the appearance of richly clothed and dripping vegetable fountains. It is a plant which, if he had room only for one, we should advise every person to plant, and in after years he would thank us for the advice. We can conceive nothing finer than a group of this lovely plant, and fortunately it is now cheap enough to plant in groups. Other beautiful specimens of this tribe of plants, more immediately connected with the rockwork, were Abies Clanbrasiliana, pigmæa, and elegans; the last a small but remarkably elegant plant, and the others, for the kinds, of unusual size.

Our next engraving is a view up the lawn, from near the group of large trees to the left, and taking



in a small portion of the garden front of the mansion. This view also shows a part of the rocky garden, with its raised beds and rock pathways, but not a vestige of this garden can be seen from the house; indeed from thence the view is purely sylvan, and, except in the season of the blooming of the American plants, scarcely a flower can be seen from the windows: yet few gardens are so rich in flowers at all seasons as the one we are writing of. The collection of bulbs and herbaceous plants is very unique; and Mr. Cox has long been known as an enthusiast in the grouping system of flower gardening, which he carries out with admirable taste. One thing, in concluding this paper, we cannot but regret, and that is, that the Pinuses we have noticed are planted so closely together. Already the fair proportions of some of the most beautiful have been shorn by their rude neighbours: yet the trees are too large to be removed; and to destroy these infantile representatives of the monarchs of the North American forests, and of poor Douglas's labours, would be almost a criminal act. They stand there, however, as beacons to be avoided in planting, and it would be well if some planters of the present day were to take a lesson from them.—A.

# A NOTE ON THE DAMPSHA MELON.

By Mr. H. C. OGLE, Gardener to the Earl of Abergavenny, Eridge Castle, Kent.

If this valuable Melon, although not of recent introduction, appears to be so little known that, with few exceptions, it does not find a place in the catalogues of seedsmen. It was introduced as a Persian variety about fifteen years since, and a notice of it was published in one of the volumes of the Transactions of the Horticultural Society. Now, it appears to me a most singular circumstance that a Melon, having such valuable qualities as this has, should have been so neglected. It is superior in flavour to many varieties commonly grown, but its chief merit is that of remaining good and retaining its flavour from two to three months after it is cut. Having now grown it three seasens, I

can speak with confidence of its good qualities. This variety, with several more, was kindly forwarded to me in the early part of 1848, by Messrs. Wood, Nurserymen, Maresfield, and this one proved so excellent, that the following year I cultivated it more extensively, and on September the 4th exhibited one at the London Horticultural Society; not, however, with a supposition that it would equal in flavour some of the summer varieties, but merely to bring it into notice for its valuable quality of keeping long after being cut from the plant; on being cut up, its flavour proved so good, that a certificate was awarded it as being the second best exhibited, the Bromham Hall taking the first place. although a Persian variety, is cultivated with less trouble and greater certainty of a crop than any other Melon I am acquainted with. For a late crop I sow about the latter end of April, and when the plants are ready, plant them in the frames from which I have taken a crop of Potatoes. I neither remove the soil nor give the beds any additional heat. The plants have a slight sprinkling early every fine afternoon, and the frames are closed until the following morning. I give an occasional root watering if the soil is found to be very dry. This variety being an excellent bearer, a large crop of fruit may be produced at a very small amount of expense and trouble, and with one or two other sorts for summer use, would be sufficient for any establishment where really good fruit is required regardless of size. It is a much too common practice to grow several sorts in a garden, sometimes in the same frame or pit, when it is almost impossible to get the seed true, and it is most vexatious to find the produce of your care and attention worthless.

The variety under notice is a cylindrically shaped, naked fruit, the skin thin but hard, of a pale yellow; striped or blotched with a dark olive colour when ripe. The flesh is firm and pale green. It has grown with me from six to nine inches long, and from three to four and a half inches in diameter, and weighing from three to five pounds. I hope ere long it will be known as it deserves.

# ON THE CULTURE OF GLOXINIAS AND GESNERAS.

BY MR. J. L. MIDDLEMISS, GARDENER AT BENTHAM HILL, TONBRIDGE WELLS.

MHE genera Gesnera and Gloxinia are so well adapted to our requirements for decorative purposes, the same treatment suiting both, that one or more, according to the extent of our means, may be had in flower most part of the year. In order to secure this very desirable object, where the command of a little heat can be obtained, a few of the bulbs which have been longest at rest may be potted and started into growth early in December; and others may be started at intervals of a month or six weeks up to June, for a regular succession throughout the season. The largest batch should be started in March, to make a fine display from July to September, when other denizens of the stove and greenhouse have ceased flowering, and are preparing for another campaign. If care be always taken to start the bulbs in the same order in which they go to rest they will become so habituated to the treatment, that they will generally be ready to start at the proper time every season.

The soil that I have found the earlier sets to do best in, is equal parts half decayed beech leaves and good peat, with a very small portion of mellow turfy loam, and a goodly quantity of silver sand. As the season advances, a little more loam may be used, and a little well-rotted cow-dung. The pots, which may vary in size from five to eleven inches in diameter, according to the size and age of the bulbs, should be thoroughly well drained; and it may be well to mix some small pieces of charcoal amongst the compost, in order to insure porosity in the mass, as the Gloxinia is particularly They should be potted into their flowering-pots at once, impatient of stagnant moisture at the roots. covering the bulbs very slightly and pressing the soil firmly, but gently, around them. They should then be placed in a moist part of the stove, or in a cucumber frame, or any where else where they can have a little bottom heat; and as soon as they begin to grow, they should be placed as near the glass as possible, being careful at all times to shade them from the fierce rays of the sun, intense sunlight being inimical to a healthy development of the leaves, causing a crumpled appearance, and consequently acting detrimentally to the production of flowers. As the season advances (say in May), it will be sufficient to place them in a close frame, where they will not require any other heat than that derived from the sun, shutting up early, and damping round the frame to secure a high moist temperature for a few hours in the afternoon; and tilting the frames at night to induce a healthy robust growth, by a free circulation of air, when the plants may be said to be asleep. A front shelf in a vinery near the glass, where the shade is not too dense, is the very best place for them, gradually inuring them to a cooler and drier atmosphere, until finally removed to the conservatory or greenhouse. But in winter it will be necessary to keep them in the stove, else they will not continue to flower freely.

The fresh soil at potting will generally contain enough of moisture to start them into growth; but as they advance in growth they must be liberally supplied with water, as, notwithstanding their aversion to stagnant moisture, they are fond of plenty of water when in rapid and luxuriant growth, showing the necessity of good drainage. In watering, care should be taken not to water over the young shoots, and never at any time over the leaves, but obtain a moist atmosphere by watering round the frame or shelf where they are standing.

If the bulbs be large they will generally produce a number of shoots, the weakest of which in the Gesnera should be rubbed off, leaving from three to seven or eight of the strongest, according to the size of the bulbs. The Gloxinia may also have its shoots thinned out to admit a free circulation of air amongst them.

They may be raised from seeds sown in spring, or from cuttings or leaves inserted in sand under a bell-glass, and placed on a little heat. These latter will form bulbs which will make nice little flowering plants in the spring, if potted in December, after they have had a short rest. These will be found very useful for placing amongst other plants in vases, or for drawing-room decoration.

After the plants have done flowering they should be induced to go to rest by gradually withholding water, and placing them where they will get plenty of light. When ripened off, they may be stowed away in their pots in any dry place where the temperature never falls below 50° till again wanted to be started into growth.

I tried an experiment with the Gloxinias in 1849; in fact, the same as that suggested by Mr. Beaton, in the Gardeners' Magazine of Botany. I was induced to try it from having observed the curious sports in the Laburnum, and I was in hopes that a bud might be formed on a bulb, containing within the one bulb the nature of the two plants from which the leaves were taken. But though I succeeded in obtaining, in two instances, what appeared to be an amalgamation of the bulbs formed at the base of the two leaves, I failed in producing a plant with the constitution of both plants from which the leaves were taken: both bulbs have flowered this season, but the flowers were those of one only of the parent plants. Not having then had the benefit of Mr. Beaton's remarks, I may have failed from want of attention to some little points. I have therefore tried again, and this time, I hope, with success, for I have four bulbs which certainly are an amalgamation of two distinct varieties of Gloxinia; and I think I have a few more bulbs which are an amalgamation of Gloxinia rubra and Gesnera Cooperii.

[We shall hope to hear the results of these experiments.]

# BOTANICAL FRAGMENTS.

Note death of Dr. H. F. Link, Professor of Botany, and Director of the Botanic Garden, at Berlin, a science has recently sustained a heavy loss: his mind, indeed, was not of the highest order; but his energetic, observant habits, and his powers of systematic arrangement gave importance to his labours. From these causes Dr. Link's writings, which were numerous, and of which Elementa Philosophice Botanice, has been the most useful, rank among the most valuable contributions to botanical science of the century in which he lived; though now superseded by such modern works as that of Schleiden. Dr. Link was one of those venerables who connect the present with the past, for he was contemporary with Linnaeus. His annual reports on the progress of physiological botany, containing a summary of all that had been published during the year, accompanied by sound criticisms and valuable remarks, have done much for that department of science. Dr. Link had attained his eighty-second year, and his literary career extends back for more than half a century.—(Lit. Gaz.)

Schleiden's notion of the production of the embryo, in vegetable impregnation, from the extremity of the pollen tube, is concluded by Gærtner to be rendered highly improbable, by reason of the identity of type which he found to be exhibited in certain mules, the result of some experiments made by him in counter-impregnation. In this view, the Rev. M. J. Berkeley concurs. Two different kinds of pollen could searcely be expected, if such were really the case, to produce two perfectly identical plants.—(Journ. Hort. Soc. vi. 2).

It has lately been ascertained, that the fecundation of the ovarium in plants is promoted by moistening the stigma with the honey secreted by the flowers. Doubtless this is because no impregnation can be effected before the separation of the lobes of the stigma; and, in consequence of the treatment mentioned, the pollen adheres to it, until that division takes place.—(Ibid).

The Bolbophyllum Lobbii, described at p. 203 (vol. ii.), is now made by Dr. Lindley the type of a new genus which he calls Sarcopodium. With it are ranged a few other species, which, growing like

Bolbophyllums, have yet a hornless column, four pollen masses, and large leathery flowers. The new genus is intermediate between the Dendrobes and Bolbophyls.—(Paxt. Fl. Gard. i., 154).

The root-point (spongiole of De Candolle) is a very curious portion of the plant. It is distinguished externally by its globular shape and lighter colour; internally by the circumstance that neither vessels nor the accompanying extended cellular tissues penetrate into it. This last character has been hitherto overlooked. The lower portion of the root-point consists of rather large, angular cells, containing globular grains of starch collected into a mass, and turning blue with iodine. In those root-points of the Hyacinth which I have examined, this has always been the case; but in the root-points of other plants, the granules in the cells have turned brown with iodine, as occurs also in the upper cells of the Hyacinth. The cells of the root-points are round or angular, larger or smaller, and even extended transversely; and there are always to be found on the outside some cells which scale off, and in their places others are produced which in their turn scale off, thus constituting the well-known scales of the root-points. Many philosophers have believed that the root-points served to suck up the nutritive juices from the soil, and De Candolle on that account called them spongioles; but the very accurate observations of Ohlert (Linnaa, 1837, p. 609) prove that this is not at all the case, for plants whose root-points hang free in the air continue to grow even when these points are cut off and closed with sealing wax, only in that case it is necessary that the roots themselves be in water, or in moist earth above the points. It is worthy of remark that precisely at the point where the absorbing surface commences, there also the vessels with their accompanying cellular tissue commence.—(Link in Journ. Hort. Soc., vi., 29).

In mule plants, especially when obtained from such as have long been cultivated, or between species which have a very intimate elective affinity, and are so closely allied to each other as to appear merely varieties, slight differences as of form and colour sometimes occur, but have no constancy and cannot be obtained with certainty on repeated experiments. Mr. Herbert supposed variations of this kind to result from the application of a quantity of pollen insufficient to produce a real typical mule, though potent enough to produce slight changes. Gaertner is opposed to this notion, on the ground that experiments seem to show that the completeness or incompleteness of impregnation influences merely the perfection of the fruit and seeds, and that a quantity of pollen insufficient for the impregnation of an ovarium produces only imperfect fruit and seeds, but gives rise to no distinct type; for unless a proper quantity of pollen be applied, the seeds are never perfected, or the embryo is inert.—

Journ. Hort. Soc., vi., 3).

The Barbacenia Rogierii, figured in our vol. ii. (p. 209), was raised from seed in Mr. Van Houtte's establishment at Ghent. M. Van Houtte informs us, that it is of hybrid origin, having been obtained by fecundating Barbacenia sanguinea with B. purpurea. Its name commemorates the Belgian Minister of the Interior. The plant, which is a very fine stove perennial, is sufficiently distinct as an object of culture, from B. purpurea, with which some persons have thought it synonymous.—M.

# INARCHING TO SUPPLY VACANCIES IN FRUIT TREES.\*

IT Corbeil, near Paris, some Pear Trees have been managed in a peculiar way by M. Fourké. They are fine trees, covering a wall, and trained horizontally; but they were not planted when young, and trained progressively in order to produce this regularity. On the contrary, they were planted when large and irregularly grown, having in some places a redundancy, in others a deficiency, of branches. Various means are frequently resorted to with the view of supplying branches where wanting; such as notching, budding, or side-grafting the stem; but here the desiderata were obtained by inarching the growing extremities of adjoining shoots to the parts of the stem whence the horizontals should proceed. Supposing the branches of a tree are trained horizontally a foot apart, with the exception of some where the buds intended to produce branches did not break, as is often the case; then a shoot is trained up, and, when growing in summer, a small slice is taken off near its extremity, and a corresponding extent of surface immediately below the inner bark of the stem is exposed; the two are joined together, and the point of the shoot is inclined in the proper direction to form the branch. The most remarkable feature in the trees at Corbeil is the uniformity of vigour in the respective branches. This is a great advantage which the mode possesses over budding or side-grafting. At the distance of a foot apart for the horizontal branches, it takes as many years to cover the wall as the latter is feet in height. The intermediate stage might, however, be readily supplied by the method above detailed; and a wall twelve feet high might be covered as well in six years as it otherwise would be in twelve.—R. Thompson.

\* Journal of the Horticultural Society.





Metadicada nigra

#### METRODOREA NIGRA.

Nat. Order.—RUTACEE & DIOSMEE-AMERICANE.

Generic Character. — Metrodorea, St. Hilaire. — Calyx small, five-toothed. Corolla of five hypogynous petals, inserted below the disk, much larger than the calyx, valvate in æstivation, spreading. Stamens five, inserted between the lobes of the disk, alternating with the petals; filaments very short, subulate, reflexed: anthers introrse, two-celled, heart-shaped, affixed by the back, versatile, dehiscing longitudinally. Orary immersed in and covered over by the disk expanded over it, tuberculate, five-lobed, five-celled. Ovules two in a cell, appended collaterally to the central angle, anatropous. Style

very short; stigma obtuse, undivided.—[Endlicher Gen. Plant. 5998].

Metrodorea Nigra, St. Hilaire. — Dark Metrodorea. — Leaves ternate, leaflets obovato-lanceolate, acute at both ends; partial petioles short, thickened, articulate at the base; common petiole 1-2 inches long, somewhat thickened, at the base; and auricled so as to enclose the bud in its axil; panicle large, somewhat loose, and pyramidal, terminal, clammy-pubescent upwards.

Syn.-Metrodorea nigra, St. Hilaire in Fl. Bras. i. 81, t. 16.

ESCRIPTION. — A branching shrub, growing 5-6 feet high; branches divaricated, pale grey. Leaves ternate, the leaflets about 3-5 inches long, 1-2 broad, lanceolate-oblong, acuminate at both ends, quite entire, very glabrous; petioles 9-15 lines long, convex beneath, narrowly channeled above, thickened-articulate at the end. Panicles sub-sessile, 8-9 inches long, often subtended at the base by leaves an inch long, of the same shape as the stem leaves. slender, many-flowered, rather lax; rachis slender, glabrate at the base; rather hairy and clammy above. Primary branches spreading, angular, clammy pubescent; inferior opposite long, filiform at the apex, upper sub-alternate or alternate, gradually shorter, uppermost very short; secondary branches about one inch long, gradually shorter, filiform, resembling the primary, but more frequently alternate. Bracts at the bases of the branches, twigs and pedicels rarely solitary, more frequently in pairs and opposite, scarcely 1 line long, gradually smaller, awl-shaped, canaliculate, with fine viscid hairs. Pedicels about 1-2 lines long, one-flowered, somewhat thickened at the summit, slightly hairy, atro-rubescent. Flowers about 3 lines in diameter. Calyx rather thick, green, glabrous, the lobes semi-ovate, acute. Petals 5, ovate-lanceolate, Filaments dark purple; anthers broadish at the base, acute, very glabrous, dark purple. acuminate at the apex, golden yellow. Gynophore dark purple; style cylindrical, slightly five-furrowed, dark purple; stigma dark purple or green. Dissepiments and columclla of the ovary dark purple. The dried plant emits a dull odour of fennel.-A.H.

History, &c.—The Metrodorea nigra is a Brazilian plant, inhabiting the province of Rio Janeiro; it was found in the bed of a brook running into the canal of Sebastianopolis. We believe it was first introduced to this country in 1846, the Horticultural Society of London having received it from Dr. Fischer of St. Petersburg. Our drawing was made from a plant presented by the Horticultural Society to the garden of the Society of Apothecaries, in which it bloomed during the summer of 1850. Though rather coarse-habited, the blossoms are singular and pretty; and as a plant possessing a distinctive character, it may be considered as worth growing when the larger stove plants are accommodated. The genus is named in memory of Metrodoro Sabino, who, according to Pliny, was the first to illustrate plants by means of figures.

CULTURE.—A strong grower, requiring plenty of pot-room, and to be planted in a mixed compost of peat, loam, and sand, such as is commonly used for the choicer potted plants of large size. It requires the climate of the stove. To propagate it, cuttings should be planted in sand, and placed within the influence of a close atmosphere and a genial bottom heat.—M.

# ON VARIEGATION IN PLANTS.\*

By Dr. MORREN, PROTESSOR IN THE UNIVERSITY OF LIEGE.
THE DIFFERENT THEORIES OF VARIEGATION.

M NCIENT physiologists considered variegated leaves, as well as those having a naturally yellow tinge (when they are generally green in the same species), as particular diseases, which they classed among cachexies, and to which they gave the name of vegetable jaundice. It was not precisely that ctiolation which is produced by the absence of light; for if the spotting were a jaundice, etiolation

• From Dodonea, ou recueil d'observations de Botanique. Brussels.

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H

Variegation has continued to be held as a symptom of would be attended by chlorosis, or paleness. disease; neither have the researches which have been made respecting it been attended with any amount of positive information, as to the cause which produces this phenomenon, and especially on the nature of the tissues deviating from their habitual colour. The experiments of Knight on the fertilization of a White Chasselas, and a White Frontignan, by a Vine from Syria, led to the opinion that the variegation might be the result of hybridation, seeing that plants having variegated leaves were obtained by this operation in the instance alluded to. At the present day, when we possess new and more ample details on the streaking of flowers, and on the influence which the variously coloured pollen exercises in the production of corollas with numerous tints, it would seem still more reasonable to believe that the variegation of leaves in plants raised from seed, is indeed a phenomenon of which the first cause has its source in fertilization. But it may be remarked that the production of a branch with variegated leaves, on an old tree whose leaves are of the usual green, materially invalidates this opinion. Even in plants raised from seed, variegation is a phenomenon sometimes so local that it appears at first absurd to seek the cause of it beyond the organ or part on which it is present. Take, for example, the Oxalis acetosella, on plants of which are sometimes found, among a good number of leaves quite green, one or two presenting a beautiful variegation; that is to say, a yellow reticulation on all the nerves and veins of the three obcordate folioles. In this case, the phenomenon is evidently quite local; and as we shall, by and by, demonstrate the organic cause of variegation, this fact will be established beyond all doubt.

In 1830, M. Schlechtendal gave a long enumeration of variegated plants—a list of which is of considerable interest to horticulturists, since these "sickly" plants have excited, sometimes, a singular mania among amateurs which has so often been turned to advantage by the trade. Miller relates, that in his time, when the variegated hollies were introduced to England, they excited so great a passion, or "rage," that all other plants seemed to be forgotten. We have, ourselves, known an amateur of Liege, who was so fond of these variegated hollies, that he left an order in his will to have a collection of them planted over his grave, and his heirs have religiously fulfilled his wish.

M. De Candolle, who is of opinion that all plants may present variegation, hesitates to class this phenomenon among those of physiology. To him, it appears sometimes a capricious monstrosity, allied to the reproduction of seed,—to hybridation; sometimes a resemblance of atavism. According to the same author, it would still be a spontaneous production, as in the singular case cited by Hales, and since referred to by numerous authors, in which a variegated Jasmine, grafted on a common one, was stated to have communicated its variegation to the leaves below the graft, a circumstance which would be extraordinary. M. Moretti, cited by M. De Candolle, would appear to have concluded from this fact that the variegation is a malady which is capable of being transmitted in all directions in the tree. The physiologist of Geneva, in speaking in another place of variegation, only mentions the yellow and the white, regarding these colours as original, primitive, and preserved in one part, while the green is developed around it. This view is indeed admissable as far as regards these tints, but not for the red brown or rusty colour, or even the white, which is found in those varieties of variegated trees which horticulturists designate tricolored. On a Euonymus europæus, with leaves margined with white, we have seen, it is true, that the youngest leaves, which were scarcely green, were already white at the margin, so that this margin quite preserves its original tint, that which it acquired at its first formation; but on the Acer, the Cratagus, &c., where we find red markings, these are of a subsequent formation, and do not indicate a primitive tint: it is evidently a colour which has been acquired. Moreover, we may add, that on Piper verticillatum we have seen the leaves developed green, and grow to their usual size with that colour; then, by and by, the nerves turned white, so much so as to present, when old, that variegation which we have designated under the name of reticulated variegation.

M. De Candolle remarks that endogenous plants present pale longitudinal bands parallel to the nerves, while exogenous ones have more irregular spots, a circumstance easily explained by the difference of the system of nervation in the two great orders of plants. This writer further adds that these bands, or these spots, belong to parts in which the chlorophyll is not perfectly developed, either in quantity or quality, to be rendered green by the action of the sun. The direct cause of this phenomenon, says this physiologist, is entirely unknown. It is just this cause that we wish to discover.

We must, however, before detailing our observations, render full justice to the labours of M. Treviranus, of Bonn, who, in this investigation, as in many others, has thrown much valuable light on his subject. M. Treviranus first remarked that in monocotyledons the variegations form bands parallel to the nerves; in dicotyledons, as in Carduus marianus, the white is produced on the nerves, while, in other cases, as in Aucuba japonica, the yellow spots are distributed without order. He also made the important observation that sometimes the variegation is visible on the upper face of the leaves, while

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the under face has none; and by examining a section, he discovered that the parenchyma of the first is only achromatic or colourless. Again, the whitened part is thinner than the green part, and the small cells are destitute of the green granular substance (chlorophyll), which causes them to appear like white spots aggregately presenting a pale surface. M. Dutrochet held that they only derive their white tint from the air which is contained in the pneumatic cavities. We believe, also, that M. Dutrochet attributed to this air enclosed in the pneumatic cavities, all the forms of variegation. This view, however, though in part agreeing with the truth, is partly also opposed to the facts, as we shall show. It is true in this sense, that the variegation, as the natural white spots in Trifolium pratense, Arum italicum, Pulmonaria officinalis, Begonia argyrostigma, &c., are caused by the air, or a gas; but it is not true in this sense, that it is pneumatic cavities (lacunæ) which enclose that air. Because a leaf is deprived of its white spots by submersion in water, and the extraction of its air by the pneumatic apparatus, M. Dutrochet concludes that that air exists in particular cavities. We are not of this opinion, because the microscopic study of the plants we have just instanced, has proved to us that that air sometimes exists in the minute cells (cellulæ), and sometimes in intercellular passages (méats). ties in leaves are found, as is well known, especially in the inferior mesophyllum (the inferior system of the diachyma), and it is not this inferior surface which presents these spots, and other markings in particular: on the contrary, the superior system of the diachyma, or the superior mesophyllum in which the cellulæ are prismatic, much compressed against one another, and filled with chlorophyll granules, is the surface especially on which the albine discoloration is almost always found: it is the nonlacuniferous portion. The phenomenon cannot, then, be considered according to M. Dutrochet's view.

M. Treviranus offers better reasons for regarding variegation as a true malady produced from weakness (astheny); for plants which are variegated with white and yellow, grow more slowly, are more susceptible of cold, more readily acted on by frost, and a humid atmosphere; they flower less profusely and less frequently than other plants, nor do they bear fruit so often or so plentifully. He observes, however, that there are species in which, notwithstanding their variegation, vegetation is vigorous, as in the Aucuba japonica. He also remarks that Pulmonaria officinalis grows in several localities without spots, and that Lamium maculatum has its first leaves in spring spotted with white, while these spots disappear in summer. We believe that this phenomenon is of a different nature to that of variegation, and that it is not dependent on the same law. We have studied the spotting of leaves with some care, and we have seen, indeed, that this phenomenon is of quite a different kind to that of variegation, both in respect to the plants in which it is found, its anatomical cause, its position, its physiology, and other incidental circumstances.

M. Treviranus observes, in respect to variegation, that nature alone can produce it, and that art cannot accomplish it. But he is contradicted in this by M. Sageret. Art preserves and propagates by budding, layering, or grafting what nature has produced. But it is difficult to determine the cause of variegation in a tree growing in a forest, when the others surrounding it, growing in the same soil, the same air, and light, have none. To this reflection we may add, that those who think that variegation is always traceable to an initial etiolation, preserved and propagated afterwards to the neighbouring organs, cannot maintain their opinion with any advantage, for it is by no means rare to find light, or partly white leaves on the Rubus, growing where it is fully exposed to the sun. We know an instance near Liege, of an Æsculus Hippocastanum having a branch with variegated leaves; this branch grows exactly at the south side, and is not shaded at all by the other branches, or the surrounding trees. Miller also cites a curious case: as is well known, there is a variety of Sempervivum arboreum with leaves margined with white; this was first obtained at Badminton, the seat of the Duke of Beaufort; a branch accidentally broken and detached from the species with green leaves, after having been a little dried, was planted, and on beginning to grow, it was found to have the new leaves variegated. standing the authority of Miller, the fact mentioned seems to require confirmation. M. Treviranus regrets that the soil in which the shoot was planted has not been described; for there are some facts which indicate that here the soil exercises a very remarkable influence. Burgsdorf, cited by M. Treviranus, relates the following:-Certain snails had [partially] eaten the cotyledons and the bark of a Beech; but it survived this mutilation; the second year its leaves were variegated; the third year it was transplanted into a better soil, and there, by degrees, lost its variegated leaves. The Professor at Bonn made several observations, from which he affirms that trees with variegated leaves, by being transplanted from a poor to a rich soil return to a uniform green; so that, according to his view, th's phenomenon is connected with a particular debility in the vegetable juices, brought on by a diminution of the absorption in the root, and which does not permit the parenchyma to assume the green colour by the influence of solar light.

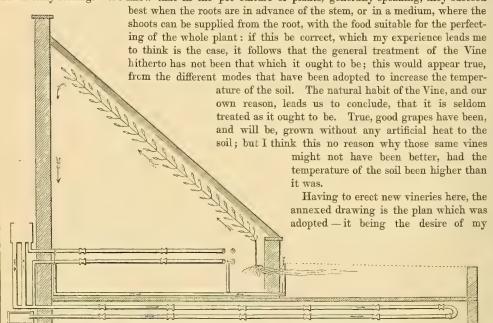
Such are the facts and such is the theory cited amongst the best physiologists of the day, with the

exception of the memoir of M. Sageret, of which we shall speak hereafter. Owing to peculiarly fortunate circumstances, we have been able to study the phenomenon of variegation under a general point of view. Messrs. Henrard and Son, nurserymen at Liege, have been interested in variegated plants for upwards of thirty years, and have collected in their establishment at St. Walburge every variety of tree, shrub, and herbaceous plant with variegated leaves, which they have been able to procure. Their nursery thus forms a real botanical hospital, in which, however, far from trying to cure maladies of paleness and astheny, they rather endeavour by all means to increase their number, and preserve them.

### VINES AND VINE BORDERS.

By Mr. A. SHEARER, GARDENER TO THE MARQUIS OF TWEEDDALE, YESTER.

MUCH has been spoken and written on the formation of Vine Borders, and the application of heat to them; and it may appear presumption in me to attempt to give anything new. This, however, I do not attempt to do. But still, I cannot help thinking that we have much to learn on these subjects, which shall be my apology for occupying your pages. I think nearly, if not quite, all are agreed that it is advantageous to have the temperature of the soil where the roots of the plants are growing, approximating somewhat to that in which the shoots are, especially in cold damp climates, and in early forcing. We know that in the pot culture of plants, generally speaking, they succeed



employer to heat the soil by some means or other, he being led to do so from his observations on the temperature of the soil, when in India. To do so by means of hot dung thrown under brick arches, was objectionable, from the amount of labour required to keep up anything like a steady heat. To cover the surface with dung was still more objectionable, from its unsightliness, its bad effects on the border, and its being opposed to the well-known laws of the conduction and radiation of caloric.

We were led to adopt the Caithness pavement, which is two inches thick, and in pieces from three to four feet square; also moderately cheap. With this was constructed a chamber, two feet six inches high, with nine-inch brick pillars supporting the pavement, and heated with hot-water pipes from the same boiler which heats the houses. We have found it to exceed our most sanguine expectations. In the first place, we have a thorough drainage, and the roots cannot by any means get into the bad soil below; but the most important fact is, that the temperature of the soil in the chamber at two feet deep, is, at all times, 9' higher than that of a border of the same aspect, not chambered. When the frost has penetrated into the latter nine inches, it has only reached two inches in the chambered border; that is, without any artificial heat being applied. The increase of 9° was quite unlooked-for, when

the border was chambered; but being supplied with soil-thermometers, for the purpose of ascertaining the temperature of the soil in various parts in the garden, and in the farm, throughout the year, we had an opportunity of knowing the fact; while, under other circumstances, it might not have been known. It also led his Lordship to cause to be chambered upwards of 300 square yards of wall-borders, for growing early vegetables, which, when made, indicated the same increase of temperature of the soil, viz. 9°.

The question will naturally arise, Can the temperature of the soil be raised to any great extent, by the hot-water pipes, with a single mat covering the border to prevent radiation in any sort of weather, excepting rain? We can raise the temperature of the soil from 50° up to 80° in eight or ten days, with a very small amount of fuel, much smaller than I could have imagined. By this mode of heating, I could keep the soil where the roots are at a temperature of 80°, while the shoots would be at the freezing point, by merely opening or shutting the valves of the hot-water pipes.

In order to find out correctly what effect a quantity of fermenting dung laid on the surface of a vine border not chambered would produce in raising the temperature of the soil at 1 foot 6 inches deep, on the 17th Dec. 1849 I covered the border three feet deep with good fermenting stable dung and leaves, turning it occasionally and adding to it. When the dung was put on, the temperature of the soil was 40°; on the 17th January 1850, it was 42°; 17th February, 53°; 17th March, 53°; 17th April, 53°; 17th May, 58°. Until the end of March the temperature of the dung was from 70° to 90°, when it fell gradually until the end of May, when it was taken off. On the 17th of June, by the heat of the sun, it had risen to 60°; July 17th, 63. While that quantity of dung raised the temperature of the soil 13°, the chambered border stood till the 17th February (when the hot water was let on), at 49°, only 4° lower than the unchambered border with all the dung. From this it would appear that the dung has little effect in heating the soil. It only prevents radiation; and a slight covering has nearly the same effect as a greater thickness of fermenting dung. This I have proved by some experiments I have made, which if suitable to your readers, I would be happy to detail at a future time.

[Mr. Shearer has here supplied us with abundant material for thought. Some of his revelations relative to the heat of chambered borders are very remarkable, and we look to him for information still more interesting on the same or kindred subjects.]

# THE HEDGE PLANTS OF INDIA.\*

The present moment, when the Agriculture and Horticulture of India are exciting so deep and so general an interest in this country, we hail with pleasure the appearance of this pamphlet from the pen of one whose devotion to the industrial science of the East, and whose wanderings in the Peninsula for many years while in the execution of duty, not only qualify him in an eminent degree for judging of the true causes which tend to retard industrial progress in these unhappy lands, but enable him with some confidence to suggest healthy remedies, and to point out the best channels for future exertion. In the paper now before us, his observations are chiefly directed to the present condition of Indian fencing, with suggestions for its renovation and extension. This department of agricultural improvement is, in India, of vital interest, and has many and important bearings on the successful cultivation of the soil. Differing widely from this country in its geological, physical, and climatic features, India demands a peculiar system of agriculture, equally different from that adopted in our land. We may briefly indicate the present condition of agriculture in these eastern lands, as exhibited by Dr. Cleghorn; and his remarks sufficiently show the severe want which is felt of a better system of fencing than that at present so imperfectly followed. He remarks:---

"The system of Indian husbandry continues much in the rude state our fathers found it a century ago. In the day of rapid progress at home, agriculture in Hindoostan evinces few signs of improvement. The farming utensils are simple and wretched; the most abject utilitarianism characterises field operations. With the Ryot no motive seems to exist beyond providing the means of immediate subsistence: he scratches the soil with his black-wood plough, tipped with 100, and made light with the pole of bamboo, so as to be carried on the shoulder; he drops the seed upon the furrow, drags a log of wood,—hollowed like a trough but open at the ends,—to break the clods and smoothen the surface, or draws a few thorny branches of Acacia over the held, which may be termed the brush-harrow of the Hindoo; nature has been bountiful—man is indolent, and gives himself no concern about his crop, trusting for the anticipated harvest to the immense productiveness of the soil, which yields, in many parts three a year, such abundant crops under the favouring rays of a tropical sun, that the cultivator is not stimulated to farther exertion. The Ryot, however, understands irrigation and the succession of seasons, but knows little regarding the bicanial or triemnial rotation of crops. The sites of tanks are invariably well chosen, being selected where one or more nullatus or water-courses naturally meet in a convenient locality for embankment. Manure is never employed on the cotton plains, although usually in sugarscane fields, and to a great extent in Sooparce gardens, as well as to the root of grape vines and pine-apples. The manure used generally consists of rotted leaves, cow-dung, wood ashes, blood, dead fish, &c.; and indeed the dunghulls of Betel plantations are so valued as occasionally to become the subjects of litigation. I would simply mention the fact that economy is not practised in the

<sup>\*</sup> The Hedge Plants of India, and the Conditions which adapt them for special purposes and particular localities. By Dr. Hugh F. C. Cleghorn, H.E.I.C.S.

employment of animal manures. ° ° ° There is no spring of activity among the aborigines of these unhappy lands. ° ° ° Whilst deploring that past exertions have been retarded by the indisposition of the natives to adopt the improvements of science and the suggestions of practical men, 'which they foolishly conceive to be unprofitable innovations,' there is ground for consolation in observing that the results of 'persuasion, patience, and perseverance,' are visible in the improved face of the country over large tracts, as Mysore, the Ceded districts and Southern provinces, which have been longest under our rule, and in which a cessation from war has enabled our resources to be devoted more assiduously to the triumphs of peace."

One of the great obstacles to agricultural improvement and the extension of cultivation is believed to be the want of proper fences to protect the growing and ripening crops from the ravages of animals, to which the jungles give shelter. "From the time the grain appears above ground till the harvest is gathered in, the ryot has to watch his field. This watching is difficult and often ineffectual, and hinders the farmer from extending his operations. Great devastation takes place annually from herds of antelopes and thousands of heads of cattle, which migrate or are driven from place to place in particular seasons." Truly important indeed is the preservation of the crops of a country richer in its agricultural resources than any other in the world, and yet a land in which the piteous cry of famine is not unoften heard!

In suggesting improvements in hedging "great attention must be paid to the question of local applicability," and the many opportunities which Dr. Cleghorn has had of becoming personally acquainted with the different parts of the Peninsula, enable him to judge well of the agricultural wants of the various districts. Certain tracts in the Peninsula, he says, "present botanical and geological features strikingly dissimilar: \* \* \* indeed so complete is the contrast between the extreme sterility of some tracts of the Carnatic plains, which exhibit a painfully barren picture of desolation from the total absence of wood, and the luxurious arboreous vegetation of the Neilgherry slopes, which the researches of Wight prove to possess one of the richest floras in the world, that no two countries in Europe display more opposite characteristics," the climate of the former being remarkable for excessive drought, whereas, in the vicinity of the Malabar Ghauts the atmosphere is heavily charged with moisture, the fall of rain in a season exceeding 120 inches! The Cacti, Agaveæ, and Euphorbiæ, from their peculiar structure, are best adapted to arid districts; while the Mimoseæ and Cæsalpineæ require more moisture and thrive better in the colder parts. The Bambuseæ and Pandaneæ prefer the deep soil of damp valleys.

We cannot now follow the interesting descriptions and historical details of the various plants suitable for hedging in India; and we shall therefore conclude by quoting a bare list of the species, which is interesting in more points of view than one. It is highly curious that many of the best hedge-plants are not really indigenous to India, having been originally introduced there, although now thoroughly

naturalized :---

Opuntia Dillenii, Haw.
Agave americana, L.
Euphorbia Tirucalli, L.
— antiquorum, L.
— nivulia, Buch.
Cæsalpinia sepiaria, Rox.
— Sappan, L.
Pterolobium lacerans, R. Br.
Guilandina Bonduc, L.
Parkinsonia aculeata, L.
Poinciana pulcherrima, L.

Lawsonia inermis, *L.*Lonicera ligustrina, *Wall.*Citrus Limetta, *Riss.*Morus indica, *L.*Punica granatum, *L.* 

Pedilanthus tithymaloides, *Poit.* Vinca rosea, *Willd.* 

#### I. Hedge Plants.

Mimosa rubicaulis, Lam.
Inga dulcis, Willd.
Acacia arabica, Willd.
—— concinna, D.C.
Vachellia Farnesiana, W. & A.
Hemicyclia sepiaria, W. & A.
Epicarpurus orientalis, Blume.
Jatropha Curcas, L.
Pisonea aculeata, Rox.
Capparis sepiaria, L.
—— aphylla, Rox.

II. Ornamental Plants forming inner fences.
Phyllanthus reticulata, Poit. Graptophyllum hortense, Necs.

Gendarussa vulgaris, *Nees*.
Gardenia florida, *L*.
Allamanda cathartica, *L*.

Scutia indica, Brong.

Gmelina asiatica, L.

Azima tetracantha, Lam.

Toddalea aculeata, Pers.

— nana, Rox.

Dendrocalamus tulda, Nees.

Pandanus odoratissimus, L.

Balsamodendron Berryi, Arn.

Bambusa arundinacea, Willd. ———— spinosa, Rox.

III. Plants used for edging garden walks.

Heliotropium curassavicum, L. Rosa indica, L.

Rosa semperflorens, Curtis.

#### NURSERY CALLS.

MESSRS. LUCOMBE, PINCE, AND Co.

DEING at Exeter, some short time back, I called at the nursery of Messrs. Lucombe, Pince, and Co., and very much regret that my short stay in that city precludes me from giving a more detailed account of what I should call the first nursery establishment in the United Kingdom.

The ground, a fine strong loam, and highly calculated for the purposes in which it is employed,

contains, I should say, from fifty to sixty acres, well stocked with fruit-trees, dwarf and standard, trained and untrained, and an almost endless variety of hardy ornamental trees and shrubs of every known and valuable kind. Amongst these I saw some very rare and valuable Oaks, from fifteen to twenty-five feet high, which I was informed had been "lifted" every other year, in order that they might be removed to any locality without the least possible risk. Further observation showed me that this is a general practice here with all trees and shrubs of any magnitude.

The coniferous plants at this nursery demand especial notice. As a nursery collection, in all that is rare and valuable, I do not hesitate to state that it is unequalled. Here are some hundreds of fine and noble specimens of Pinus insignis, Cedrus Deodara, and others no less hardy and ornamental, from six to eighteen feet high, all planted and plunged in crates ready to be removed with the most perfect safety in January or in June. In the "Rockery" were handsome plants of the following Junipers and Cypresses:—Cupressus: funebris, Goveniana, macrocarpa, Corneyana, torulosa elegantissima, Uhdeana, majestica, religiosa, Knightiana, and others no less beautiful. Of Juniperus were gossainthanea, occidentalis, squamata, virginiana glauca, bacciformis, pendula vera, oblonga, pendula, and very many others, whose history at present is but imperfectly understood. In Pinus Picca and Abies, let it suffice to state that the collection is no less rich.

The houses here are large, substantially built, and well ventilated; and contain a collection of plants whose worth can only be appreciated by their being seen. I may, however, glance at some few of the extraordinary specimens of pot-culture, beginning with the Stove, which contained fine specimens of Ixoras, with trusses of bloom not in the least inferior to those found in London at a May or June exhibition. In the same house were six or eight huge and beautifully grown plants of Gardenia Stanleyana, each showing not less than from seventy to one hundred and fifty bloom buds; also some fine new varieties of Allamanda. As for Hoya imperialis, no words I can employ could do justice to that noble plant, as grown here, and literally covered with immense clusters of bloom. I believe that by very many this plant has been condemned, not only as an exhibition plant but also in other respects. Let me advise those who have discarded Hoya imperialis to pause ere they throw away one of our finest stove-climbers, which may be had in bloom at any season of the year. In the same house was a most magnificent Nepenthes Rafflesiana, covered with its transparent and beautifully-variegated pitchers; fine plants of Pavetta borbonica; and Æchmea fulgens, and Caraguata, whose centres are kept filled with water, the plants being found to grow faster and bloom much stronger by this mode of treatment.

The Orchids consist of a very select and valuable collection, containing everything that is new, rare, and good, and which could only have been brought together by means of a very large outlay. Mr. Pince informed me that he had just made an addition in the purchase of some valuable kinds newly imported. Among those in bloom were the beautiful Cattleya labiata, Lælia anceps, Calanthas, Sarcanthuses, and others, too numerous to particularize. But the most remarkable objects in these houses were plants of Cyrtoceras reflexum, grown in baskets, suspended from the roof, and treated in every respect as an Orchid. They were in such health, luxuriance, and so full of bloom, that I at once saw this was the proper mode of cultivating this delightful acquisition to the stove.

From these I was shown into several large span-roofed houses devoted exclusively to Cape and New Holland plants. A great variety from those beautiful countries was to be seen here giving proof of superior skill in cultivation. On the western side of these houses stands a newly erected spanroofed house of very considerable dimensions, solely for the growth of specimens of the above. Here were noble plants of Eriostemon buxifolium, cuspidatum, scabrum, neriifolium, and others of more recent date; with Aphelexes, Phænocomas, Chorozemas, Podolobiums, Hoveas, Pimeleas, Boronias, Ericas, Epacres, &c., &c., which, for health and beauty of form, it would be somewhat difficult to match. I observed, also, in this house, some thirty or forty fine healthy plants of hybrid varieties of hardwooded heaths, lately purchased by Messrs. Lucombe, Pince, and Co., and from what I could learn of their character, they are sure to meet with a ready appreciation from the lovers of that beautiful tribe. From this I was led into a large span-roofed Camellia house, or rather a Camellia conservatory, full of Camellia trees—for, in the common acceptation of the word, I cannot call them "plants" some twenty or thirty feet high, consisting of all the more valuable kinds, in the most robust health, and covered with bloom buds above and below, from end to end, and from side to side. One concluding remark, and I have done:—The above can only convey a very imperfect idea of the superiority of this nursery. I strongly advise such of your readers as have never visited the nurseries of Messrs. Lucombe and Co., by all means to do so early in the ensuing spring, and they will have a treat little inferior to the Great Exhibition.—F. R.

# SOME REMARKS ON THE AGENCY OF MANURES.—HUMUS.

BY MR. J. TOWERS, C.M.H.S.

MHAT peculiar substance, now called humus, which has excited so much interest for the last seventeen years, and given rise to so many wild and conflicting theories, ought, doubtless, to be considered one of the most important constituents of every fertile soil. It is a product of vegetable and animal decay, and was once affectedly pronounced to be "the cooked food of plants." The reader may be referred back to the recondite article on the *Chemistry of Soils*, by Dr. Voelcker (ii., 39), where the compound nature of humus, as it generally exists, is amply described. I now propose to offer a few additional remarks, to elucidate all that appears to have been recently discovered.

Dr. Voelcker tells us, "that humus is composed of a great many organic acids and products of vegetable decomposition,"—this is true; and, therefore, it is found abundantly in rich vegetable mould, and particularly in the black remains of an old heap, composed of tree leaves and spray combined with stable manure. The precise nature and quantity of those organic acids, though of little consequence to the cultivator, have become objects of interest to the analytic chemist; thus it has been proved that two of them called crenic and apocrenic acid, are extracted by the simple process of boiling humus in pure distilled water; a third, the humic acid, by treating the residue of the former process with boiling solution of carbonate of soda; and a fourth by treating the insoluble humus which remains after the above-named processes, with solution of caustic potash. Other acids are named—such as the geic and ulmic—which are supposed to require specific and appropriate re-agents; but the inquiry is devoid of all interest, otherwise than as it may throw some light upon the compound nature of those substances that are produced by the fermentation of animal and vegetable remains in every compostheap. Admitting the inutility of minute researches, the great fact of the presence of humus in every fertile soil remains undisturbed; and, I now allude to it particularly, with a view to excite attention to the results that invariably follow the application of lime, either in agriculture or gardening.

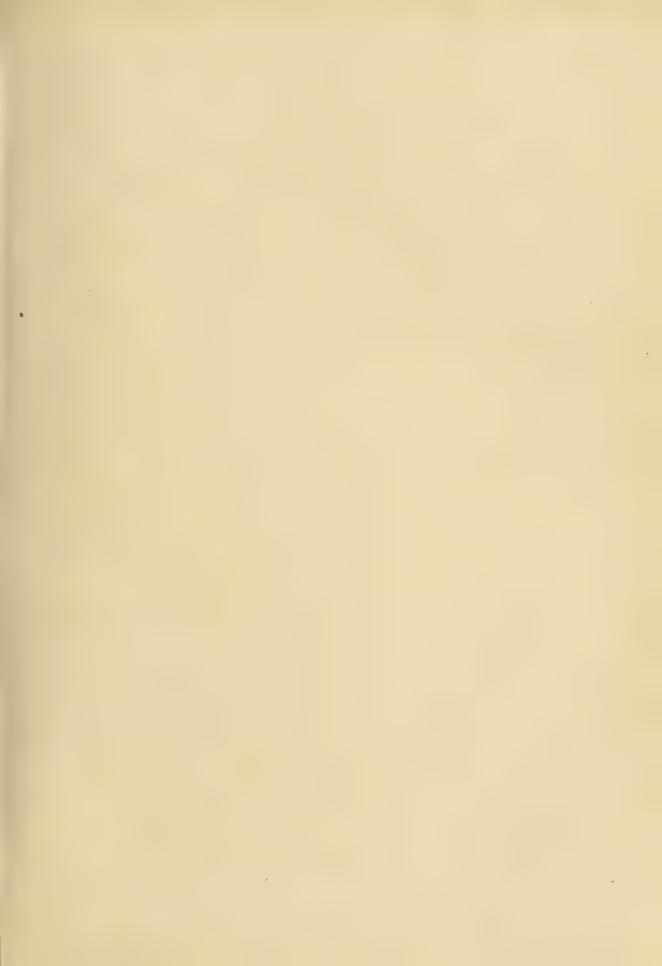
If a portion of black reduced manure, or even of rich garden earth, glutted with dung, be boiled in rain water for a few minutes, a certain quantity of colouring matter will be extracted. On adding a small quantity of any of the alkalies to the mixture, and continuing the boiling for a few minutes, the colour will become much more intense, amounting, perhaps, to that of porter. The fluid so obtained we may style humate of potash, soda, or ammonia, as the case may be. When separated from the dregs and left at rest to deposit its feculences, the clear liquid will deposit nearly the whole of the colouring matter if some clear lime-water be mixed with it. As a converse of this experiment, let a teaspoonful or two of powdered quick-lime be incorporated with an ounce or so of black spit dung, old decayed wood, or black peat, and the like humous matter; you then may add a hot solution of any of the three named alkalies, and continue the boiling for any reasonable time without obtaining any intensity of colour. Lime, therefore, is proved to be the most powerful agent in attracting and fixing the acids; or, in other words, those substances existing in vegetable mould, which are soluble in alkaline solutions. Hence, we find that pure lime (not chalk) is a specific remedy for soils rendered barren or sour by over-manuring; and a meliorator in reclaiming morasses or peat-bogs.

Liebig, in his zeal to establish the theory of vegetable nutrition by the absorbent faculty of the leaves, observes that "humus acts in the same manner in a soil permeable to air, as in the air itself; it is a continued source of carbonic acid, which it emits very slowly. An atmosphere of carbonic acid formed at the expense of the oxygen of the air, surrounds every particle of decaying humus; it is, therefore, contained in every fertile soil, and is the first and most important food for the young plants growing upon it."—(Liebig's Chemistry, edit. 4, p. 30). "Humus is soluble only when combined with oxygen; it can be taken up with water, therefore, only as carbonic acid. When moisture is absent, humus may be preserved for centuries; but when moistened with water, it converts the surrounding oxygen into carbonic acid."—(Idem, p. 96).

This great chemist strongly advocated a mineral theory, which Mr. Pusey has noticed in the Royal Agricultural Society's Journal (No. 26):—"The mineral theory he eagerly adopted was contained in the following axiom of Liebig:—'The crops in a field diminish or increase in exact proportion to the diminution or increase of the mineral substances conveyed to them in manure.' This doctrine received its death-blow from Mr. Lawes' experiments at Rothamstead in the following manner:—Wheat was grown on an arable field, exhausted for the purpose; unmanured, it produced per acre 16\frac{1}{4} bushels of wheat; with 14 tons of farm-yard dung, 22 bushels; but with the ash of 14 tons of such dung 16 bushels only."

The bare fact that soil unmanured yielded more wheat than when treated with all the ashes produced from 14 tons of that very manure which, when entire, gave an increase of  $5\frac{1}{3}$  bushels, speaks volumes. At a future opportunity I hope to make this appear.

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: Lupinus pucestens 2 L Hartwegn

#### LUPINUS PUBESCENS AND HARTWEGII.

Nat. Order .- LEGUMINOS.E.

Generic Character.—Lupinus, Tournefort.—Calyx deeply two-lipped, upper lip shorter and two-toothed, the lower three-toothed. Corolla papilionaceous; standard with the sides reflexed, the wings coalescent above and behind, the keel acuminate, with two claws. Stamens ten, monadelphous, the tube entire; anthers alternately oblong and sub-reniform. Ovary with two or many ovules; style filiform, incurved; stigma terminal, sub-rotund, bearded. Legiumen coriaceous, oblong or linear, compressed or roundish, two- or many-seeded, with oblique transverse constrictions between the seeds.—Herbs, under-shrubs or shrubs, in the warm, temperate and subtropical regions, more rarely in the tropics, all over the world; most abundantly in North America; leaves digitate with three or many leaflets, most frequently with five, very rarely simple by abortion; stipules adnate to the petiole; pedundes opposite

the leaves, terminal; flowers spiked or racemose, frequently whorled, with a single bract, most commonly with two bractcoles.—(Endlicher Gen. Plant. 6473).

LUPINUS PUBESCENS, Bentham.— Hairy Lupine (Fig. 1).—
Perennial [?], canescent with short patent hairs; stipules small,
awl-shaped; leaflets 7-9, oblong lanceolate, acute, shorter than
the petiole, hairy on both sides; flowers loosely half-whorled;
bracts very short, caducous; pedicels shorter than the calyx;
upper lip of the minutely bracteolated calyx emarginate, lower
entire; corolla glabrous; legume hairy, 4-6 seeded.

LUPINUS HARTWEGH, Lindley.—Hartweg's Lupine (Fig. 2).
—Annual, hairy; stipules bristle-like, leaflets seven to nine, oblong, obtuse; raceme elongated, many-flowered; bracts bristle-like, plumose, twice as long as the unopened flowers; setaceous bracteoles of the calyx very long; keel naked.

ESCRIPTION.—L. pubescens is a half-hardy species allied to L. Bogotensis, hoary, with short spreading hairs, which are various in form, scarcely silky in the young plants. It grows from a foot and a half to two feet high. Leaves digitate, seven-nine-lobed, the lobes lanceolate, acute, hairy on both sides, shorter than the petiole; stipules small, rarely two lines long, awl-shaped. Raceme bearing numerous flowers in imperfect whorls, the bracts very short, soon falling off; pedicels shorter than the calyx; bracteoles minute inconspicuous. Calyx two-lipped—the upper lip notched, the lower entire. Corolla violet blue. Legume hairy, with four to six seeds.

L. Hartwegii is a half-hardy annual growing about two feet high, erect, clothed with long hairs. Leaves digitate, with seven to nine oblong obtuse green leaflets, very hairy with lax hairs. Racemes elongated many-flowered, with plumose setaceous bracts, quickly deciduous, twice as long as the unopened flowers; calycine bracteoles very long, setaceous. Flowers brilliant blue with the standard reddish or sometimes purplish in the middle, the keel smooth.

—A. H.

HISTORY.—L. pubescens is found in Guatimala, and also in the neighbourhood of Quito in Peru. From the former place it was introduced by the Horticultural Society a few years since. It is a very free flowering plant, not so much known or cultivated as it deserves to be. The species is described as a perennial; but it assumes the annual character in cultivation. L. Hartwegii is a Mexican species introduced in 1838; and is one of the best of the annual species. We devote this plate (perhaps some others), to somewhat "common" plants, in the hope of seeing them introduced more generally to the gardens of amateurs, where the less showy older annual lupines are still sometimes retained.

CULTURE.—These Lupines are very desirable plants for beds and borders; and are free-growing, in good rich garden soil. They should be sown in March and April, and will then bloom from June to October. The first sowing may be made in pots in a frame as with the half-hardy annuals, if early blooming is an object.—M.

#### THE GENERA AND SPECIES OF CULTIVATED FERNS.

By Mr. J. HOULSTON, ROYAL BOTANIC GARDEN, KEW; AND MR. T. MOORE, F.B.S.

 $Sub\text{-}order\text{--} \texttt{Polypodiace}.e: \ Tribe\text{--} \texttt{Polypodiae}.e.$ 

SECT. II. -Symplophicbieae, J. Smith.—From symploke, connection, and phleps, a vein; the veins anastomosing, so as to form a network.

ENISCIUM, Schreber-Name derived from meniskos, a crescent; the fructification forming short curved lines.

Sori linear, medial, somewhat transverse, are uate or crescent shaped, continued across the junction of two anastomosing venules, and subsequently becoming confluent. Veins pinnate, curved, somewhat parallel; venules are uate, or angularly anastomosing, producing from their junction an excurrent veinlet, free, or uniting with the anastomosing venules above, dividing the surface of the frond throughout into numerous rectilinear parallelograms.

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Fronds from one to five feet long, smooth or hairy, simple pinnate or ternate; pinnæ entire, crenulate, or serrulate.-This genus, in regard to some of its species, cannot be distinguished by its venation from some Nephrodiums, in the tribe Aspidica. The only technical character that can be

pointed out, is the arched or arcuate sori, by which it is readily distinguished.

Fig. 9 represents a portion of a pinna of M. palustre (nat. size).

1. M. simplex, Hooker.—A dwarf evergreen stove fern, from China. Fronds simple, pubescent, somewhat elliptical or oblong-acuminate, dentato-serrate, from six to twelve inches long, dull green, cordate at the base, and sub-hastate; lateral, adherent to a scaly creeping rhizome. Sori medial. This species is of recent importation, having been introduced to Kew from Hong Kong in the latter part

of 1850.

2. M. palustre. Raddi. A tall robust evergreen stove species, from South America. Fronds glabrous, pinnate, from three to five feet long, rather erect; pinnæ entire lanceolate-acuminate, coriaceous, from six to ten inches long, lively green, slightly undulated and roundish, or cuneate at the base, the lower pairs often proliferous at the base of the pinnæ; lateral, adherent to a thick creeping rhizome. Stipes dark coloured near the base. Sori medial, subsequently confluent

(10NIOPTERIS, Frest (Polypodii, sp. of Authors).—Name derived from gonia, an angle, and pteris, a fern; in allusion to the angular anastomosing of the venules.

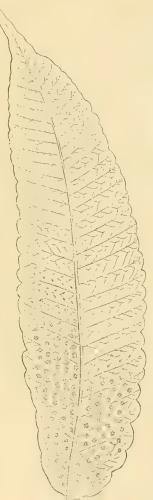
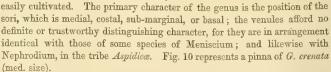
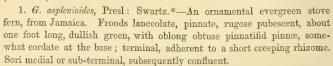


Fig. 10.

Sori round, medial or costal. Veins pinnate; venules angularly anastomosing, producing from their junction an excurrent free or anastomosing sterile veinlet. Sporecases sometimes echinate. Fronds from one to two feet high, pinnate; pinnæ entire, serrate crenate or pinnatifid; when deeply pinnatifid, the inferior pair of venules only anastomose, the superior ones being all free.—The species have usually a neat appearance, being nearly of uniform size; the fronds are mostly proliferous; they are





2. G. fraxinifolia, Presl: Jacquin (Polypodium proliferum, Kaulfuss).— An elegant evergreen stove species, from Brazil. Fronds pinnate, two feet long, with entire lanceolate-acuminate smooth shining pinnæ, dark green, truncate or somewhat auriculate at the base, proliferous throughout; terminal, adherent to an erect fasciculate rhizome. Sori medial, subsequently

3. G. crenata, Presl: Swartz.—A very handsome evergreen stove fern, native of the West Indies. Fronds one and a half foot to two feet long, pinnate, with entire oblong ovate-acuminate membranous crenate pubescent pinnæ, pale green, roundish at the base, with very short petioles. Rachis and stipes green; lateral, adherent to a short creeping rhizome.

4. G. mcgalodes, J. Smith.—An ornamental evergreen stove fern, from the West Indies. Fronds pinnate, pubescent, pale green, from two to

\* Where the names of two authors are used, the second is that of the botanist by whom the specific name was first applied to the plant, though under another genus: thus, for example, Goniopteris asplenioides of Presl is the Polypodium asplenioides of Swartz.



Fig. 9.

three feet long, with linear-lanceolate pinnatifid rather membranous pinnæ. Stipes and rachis green; lateral, adherent to a short creeping rhizome. Sori medial,

5. G. pennigera, Presl.—An ornamental evergreen stove fern, from New Zealand. Fronds pinnate, slightly pubescent, one or two feet long, with lanceolate-acuminate pinnatifid slender bright green pinnae, roundish at the base, and bluntly lobed. Fertile fronds contracted, erect. Rachis and stipes round, pale green, terminal, adherent to a creeping rhizome. Sori medial, subsequently confluent.

6. G. prolifera. Presl (Meniscium, Swartz).—A straggling growing evergreen stove fern, from the East Indies. Fronds slender, pinnate, two to three feet long, with oblong acuminate membranous pubescent pinnæ, slightly cordate at the base, and crenato-dentate at the margin. This fern grows freely, is very proliferous, pale green, but without fructification. The fronds are lateral, adherent to a creeping rhizome.

(10NIOPHLEBIUM, Prest (Polypodii, sp. of Authors).—Name derived from gonia, an angle, and phleps, a vein, in allusion to the angles formed by the anastomosing of the venules.

Sori round, terminal, naked or squamiferous, arranged in one or more transverse parallel rows. Veins forked or pinnate, the lower exterior venule free and fertile, the others angularly anastomosing, producing from their junction an excurrent, free, and generally fertile veinlet. Fronds from a few inches to five or six feet long, smooth hairy or scaly, simple pinnatifid or pinnate, the pinnæ entire, articulate, serrulate or undulate.—This is an exceedingly variable genus with regard to the size of the plant and circumscription of the fronds, but several of them are amongst the most elegant of the ferns in cultivation. The dwarf kinds have the fertile fronds contracted, while the larger species have their fronds all of one form; but they agree in having a caspitose, scaly, creeping rhizome. The species are commonly found adhering to the trunks of trees in tropical forests. The characters by which they are determined from all congeners, are the round terminal sori, combined with the angular anastomosing of the venules, and the costal arcole having an excurrent veinlet, which is generally soriferous. Fig. 11 shows a pinna of G. meniscifolium (full size).

1. G. vaccinifolium, J. Smith: Langsdorf and Fischer.—A dwarf, creeping, evergreen, stove species; from the West Indies and South America. Fronds of two kinds: sterile—simple, glabrous, sub-rotund or oblong, decurrent at the base, dark green, about half an inch high; fertile—linear, simple, glabrous, two inches long, decurrent at the base; both kinds are lateral, articulated on a thick, brown, scaly, creeping rhizome. Sori terminal, uniserial.

2. G. piloselloides, J. Smith: Linnæus.—A dwarf, evergreen, stove species; from the West Indies. Fronds of two kinds: sterile—simple, hairy, light green, ovate or oblong, decurrent at the base, from one to two inches high: fertile—simple, hairy, linear-oblong, decurrent at the base, from two to three inches long; both are articulated on a very slender, creeping, rhizome. Sori seated in a tuft of narrow scales, uniscrial.

3. G. incanum, J. Smith: Swartz.—A dwarf, evergreen, stove fern; native of the West Indies and various parts of South America. Fronds pinnatifid, six to twelve inches long, lanceolate, the upper surface dull green densely covered beneath with roundish, fimbriate, peltate, brown seales; fronds lateral, articulated on a scaly creeping rhizome; segments oblong-obtuse, coriaceous. Sori immersed, sub-marginal, uniserial. Veins internal and indistinctly seen.

4. G. sepultum, J. Smith: Kaulfuss.—An elegant, evergreen, stove species; from South America. Fronds lanceolate, pinnate, from one to one and a half foot long, densely covered throughout with narrow, fimbriated scales, which give them a whitish appearance; they have close sessile, oblong-linear, rather obtuse pinnæ. Sori uniserial on the upper half of the frond, protruding through the scales. Veins internal, indistinctly seen. Fronds articulated on a white, scaly, creeping rhizome.

5. G. argutum, J. Smith: Wallich.—A beautiful, evergreen, stove fern; from Nepal. Fronds glabrous, slender, from two to three feet long, the rachis and stipes pale brown, shining, and articulated on a sealy, creeping rhizome. Fronds pinnate, lanceolate, with lanceolate-acuminate, rather membranous, bright green pinnae, which are articulated with the rachis, serrated, and decurrent at the

base. Sori large, uniserial, yellowish brown, each furnished with numerous laciniated scales, which are soon obliterated by the swelling sori; they are immersed, forming elevated protuberances on the upper surface of the frond.



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6. G. verrucosum, J. Smith.—An ornamental, evergreen, stove species; from the Philippine Islands and Singapore. Fronds slender, slightly pubescent, four to five feet long, pendulous, lanceolate-acuminate, with oblong-acuminate, undulated, bright green pinnæ, which are slightly serrated, round at the base, and articulated with the rachis. Sori uniserial, immersed, forming elevated protuberances on the upper surface of the frond. Rachis and stipes scaly and articulated to a creeping rhizome.

7. G. subauriculatum, Blume.—A very elegant, evergreen, stove species; from Java and Luzon. Fronds slender, lanceolate, pinnate, from four to six feet long, with long, narrow, lanceolate-acuminate, membranous, bright green pinnæ, which are serrate, sub-auriculate at the base, and articulated with the rachis. Sori uniserial, yellowish brown, each furnished with numerous laciniated scales, which are soon lost by the swelling sori; they are immersed, forming elevated protuberances on the upper surface. Rachis and stipes brown, pubescent, articulated with a scaly, creeping rhizome. This species is decidedly the most beautiful of the Polypodieæ, and unquestionably the most ornamental of all herbaceous species yet in cultivation; the fronds being long and very slender, they consequently assume a pendulous position. A plant, probably the first introduced to Britain, at present growing in a basket suspended from the roof of the Orchid House, at Kew, has on it nearly twenty developed fronds, some measuring eight feet long, and having fifty-eight pairs of pinnules, with a stipe not more than eight inches long.

8. G. Catharine, J. Smith: Langsdorf and Fischer.—An evergreen, ornamental, stove fern; from Brazil Fronds glabrous, broadly lanceolate, from one to two feet long, dull green, articulated on a creeping rhizome, which is densely covered with imbricated, peltate, acuminate, brown scales; pinnatifid, with oblong obtuse seg-

ments. Sori uniserial, confined to the upper half of the frond.

9. G. harpeodes, J. Smith: Link.—A tall evergreen, stove species; from Brazil. Fronds glabrous, broadly lanceolate, three to four feet long, dull green, nearly erect, with stipes nearly half the length of the fronds; they are articulated on a thick, scaly, creeping rhizome. Frond pinnatifid, with lanceolate-acuminate, nearly entire, scimetar-shaped pinnæ, the lower ones standing forward. Sori large, yellowish brown, uniserial.

10. G. latipes, J. Smith: Langsdorf and Fischer.—A neat, evergreen, stove fern; from Brazil. Fronds glabrous, pinnatifid, one to two feet long, dull green, somewhat slender and pendulous, lateral, articulated on a green, creeping rhizome, which is covered with peltate fimbriated scales; pinnules linear-oblong, rather obtuse, membranous, undulated and repand. Sori small, biserial.

11. G. albo-punctatum, J. Smith: Raddi.—A very ornamental, evergreen, stove species; from Brazil. Fronds broadly lanceolate, pubescent, pale green, from two to three feet long, the upper surface scattered over with small white scales; they are lateral, articulated on a scaly, creeping rhizome. Fronds pinnate, with lanceolate-acuminate, nearly entire, membranous, undulated pinnæ, having the inferior base truncate, superior adnate; the upper ones sessile. Sori uniserial.

12. G. dissimile, J. Smith: Linnæus.—A handsome, evergreen, stove fern; from the West Indies. Fronds slender, pendulous, two to three feet long, pubescent, pale green, articulated on a scaly, creeping rhizome. Fronds lanceolate, pinnate, the pinnæ distant, sessile, sub-falcate, lanceolate-acuminate, membranous, undulated and somewhat deflexed, the lower ones standing forward. Sori biserial.

13. G. meniscifolium, J. Smith: Linnœus.—A tall, glabrous, evergreen, stove species; from Brazil. Fronds three to four feet long, pinnate, with lanceolate-acuminate, undulated, shining, bright green pinnæ, from six to eight inches long, having their inferior base roundish, and the upper one adnate. Sori large, yellowish brown, generally biserial. Stipes and rachis green, lateral, articulated on a scaly, creeping rhizome.

14. G. deflexum, Hort.—An ornamental, evergreen, stove fern; from Brazil. Fronds glabrous, two feet long, pinnate, with lanceolate-acuminate coriaceous, undulated, deflexed pinnæ, of a dull green, roundish at the base and articulated with the rachis; the lower pinnæ are often divided. Sori biserial. Stipes and rachis blackish green, lateral, articulated on a scaly, creeping rhizome.

YRTOPHLEBIUM, R. Brown. (Polypodii sp. of Authors).—Name derived from kyrtos, curved, and phleps, a vein; alluding to the convex or curved form of the venules.

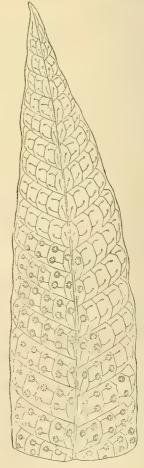
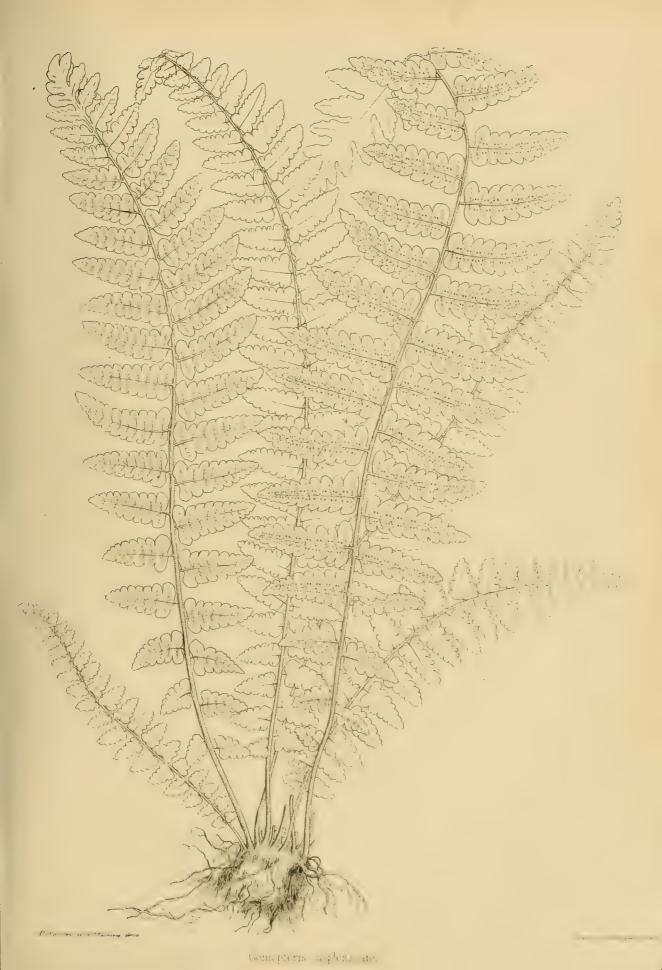


Fig. 12

Sori round, naked, lateral or terminal, arranged in two rows between and parallel with the primary veins, or irregular. Veins pinnate or forked, the lower exterior venule free and fertile, the others arountly or angularly anastomosing, producing from their exterior side two or more excurrent, free, fertile veinlets, which are sometimes

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very short, often uniting with the next superior venules, forming two rows of areoles between each two primary veins. Fronds simple or pinnate, from one to three feet long, glabrous, coriaceous or somewhat membranous; rhizome creeping.—There are various technical characters by which to distinguish this genus from the preceding ones, some of them of minor importance and perplexing unless to a practised eye. The most essential points by which it is easily recognised, are the arcuate venules combined with two series of sori, between each two of the primary veins. Fig. 12 represents the upper portion of a frond of C. repens (nat. size).

1. C. angustifolium, J. Smith: Swartz .- A slender, evergreen, stove fern; native of the West Indies and South America. Fronds glabrous, simple, acuminate, very narrow, reclining with a somewhat revolute margin, coriaceous, from a foot to a foot and a half long, dull green, decurrent at the base; lateral, articulated on a

short, creeping, scaly rhizome. Sori medial; veins immersed.

2. C. repens, J. Smith: Swartz.—A creeping, evergreen, stove species; from the West Indies. Fronds simple, reclining, lanceolate-acuminate, from one to one and a half foot long, glabrous, undulated, rather membranous, deep green, decurrent at the base; lateral, articulated on a scaly, slender, creeping rhizome. The upper surface of the fronds are scattered over with white scales attached opposite the apex of each veinlet. Sori round,

3. C. nitidum, J. Smith: Kaulfuss .- A rigid and rather erect-growing stove fern; native of the West Indies. Fronds glabrous, from one to two feet long, coriaceous, undulated, deep green and shining, lanceolate-acuminate, decurrent at the base; lateral, articulated on a short, scaly, creeping rhizome. Sori medial or terminal; veins indistinct.

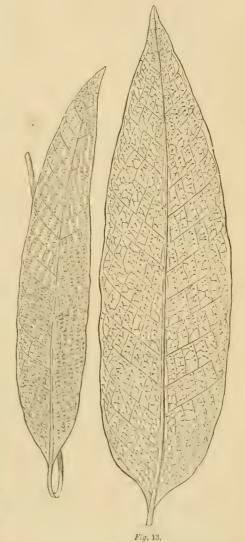
4. C. Phyllitidis, J. Smith: Linnæus.—A rigid and rather erect-growing stove fern; from the West Indies, Fronds simple, glabrous, from one to two and a half feet long, rather narrow, slightly undulated, pale green, lanceolate-acuminate, coriaceous, decurrent at the base; articulated on a scaly, short, creeping rhizome. Sori medial.

5. C. decurrens, J. Smith.—An ornamental, evergreen, stove species; from Brazil. Fronds glabrous, pinnate, from two to three feet high, rather erect, with lanceolate-acuminate, narrow, membranous, pale green pinnæ, which are six to ten inches long, decurrent at the base, and running down the rachis; they are articulated with a scaly, creeping rhizome. Sori ter-

TIPHOBOLUS, Kaulfuss. Name derived from in allusion to the fronds being covered with a white starry pubescence.

Sori round, terminal, sometimes irregular and then usually confluent, protruding through dense stellate pubescence. Veins pinnate, internal, indistinct; venules parallel, transversely anastomosing, producing from their exterior side, from two to five free or irregular anastomosing veinlets, which are soriferous at their apices. Fronds simple, from one to one and a half foot long, thick and fleshy, or coriaccous; fertile fronds generally contracted; rhizome creeping.—This genus has the most definite characters of any in this section of Polypodieæ; for in the absence of fruetification it is at once known by its stellate pubescence and simple fronds. The internal obscure venation cannot be well seen unless the cellular tissue of the frond is destroyed; it is one of the most exquisitely beautiful of all the forms of venation developed throughout the whole family of Ferns. Fig. 13 represents a fertile frond, and a sterile one of N. Lingua (nat. size).

1. N. nummularifolius, J. Smith.—A very elegant



little evergreen stove species, native of the East Indies. Sterile frond subrotund, half an inch in diameter, light green, very fleshy. Fertile frond linear, two inches long, decurrent at the base. Both are articulated on a

scaly creeping rhizome. Sori round, subsequently confluent, covering the whole under surface; veins and costa immersed in the substance of the frond.

2. N. rupestris, Sprengel. — A dwarf evergreen greenhouse species, from New Holland. Sterile frond roundish or oblong-ovate, one to two inches long, decurrent at the base. Fertile frond linear, three to four inches long, obtuse at the apex, and decurrent at the base. Both kinds are dull green, and articulated on a scaly creeping rhizome. Sori round, confined to the upper half of the frond; veins and costa immersed.

3. N. pertusus, Sprengel.—A very fleshy evergreen stove Fern, a native of the East Indies, China, and New Holland. Sterile frond oblong-ovate, obtuse, decurrent at the base, three to four inches long. Fertile frond linear, four to eight inches long, decurrent at the base. Both are of a light shining green, and are articulated on

a scaly ereeping rhizome. Sori confluent on the upper half of the frond; veins and costa immersed.

4. N. varius, Kaulfuss.—An ornamental evergreen stove Fern, from the Malay Islands and Singapore. Sterile frond lanceolate-acuminate, from six to twelve inches long, decurrent at the base. Fertile frond, linear-lanceolate-acuminate, decurrent at the base, one foot long. Both kinds are densely covered throughout with stellate pubescence, and are articulated on a scaly creeping rhizome. Sori on the upper part of the frond, confluent in oblong masses; costa nearly immersed.

5. N. Lingua, Sprengel. (N. chinensis, Link).—A very pretty evergreen stove species, from China and Japan. Sterile frond lanceolate-acuminate, six to ten inches long, decurrent at the base, dull green on the upper surface, and whitish beneath. Fertile frond contracted, but nearly the same form as the sterile, and of equal length. Both are articulated on a scaly creeping rhizome. Sori arranged in transverse parallel rows, between the primary veins, throughout the whole under surface of the frond; brownish red; costa elevated; veins immersed.

HLEBODIUM, R. Brown. (Polypodii, sp. of Authors).—Name derived from phleps, a vein; from the generally conspicuous venation.

Sori round, oval, or rarely oblong-linear, transversely uniserial or biserial, sometimes irregular. Veins pin-

nate, or variously branched; venules arouately or angularly anastomosing, producing on their exterior side, or at their angular junction, two or more conniving veinlets which are sporangiferous on their combined apices, or line of junction. Fronds simple, pinnatifid or pinnate, from a few inches to four feet long, glabrous or squamiferous, coriaceous or membranous; rhizome creeping.—The species of Phlebodium in habit and in the circumscription of their fronds, resemble some Goniophlebiums and Drynarias. The principal technical characters, by which they are distinguished from other genera, are: the sori being produced on the confluent parts of two or more veinlets, which generally terminate in the exterior row of areoles; the irregular branching of the veins and venules; and the costal areole being sterile. Fig. 14 represents a portion of a segment of *P. glaucum* (nat. size).

1. P. squamulosum, J. Smith: Kaulfuss.—A dwarf creeping evergreen stove Fern, from Brazil. Sterile frond simple oblong-elliptical, erect, two to three inches high, dull green, coriaceous, attenuated at the base, and articulated on a scaly creeping rhizome.

2. P. venosum, Hort.—An elegant dwarf evergreen stove species, from South America. Sterile frond simple oblong-lanceolate, six to eight inches long, undulated, attenuated at the base, dull green, with conspicuous dark veins. Fertile frond simple, contracted, linear-lanceolate, attenuated at the base, six to eight inches long. Both forms are scaly on the rachis and stipes, and are lateral, articulated on a cæspitose creeping scaly rhizome. Sori oval or oblong, uniserial.

3. P. lycopodioides, J. Smith: Linnæus. (P. glabellum, R. Heward).—A rather pretty evergreen creeping stove species, native of the West Indies. Fronds simple, two to four inches long, oblong-lanceolate, rather obtuse at the apex, attenuated at the base, membranous, undulated, and light green. Sori round, uniserial. Fronds lateral, articulated on a scaly creeping rhizome.

4. P. nitidum, J. Smith.—A dwarf evergreen stove Fern, from Honduras. Fronds glabrous, simple, three to six inches long, oblong-elliptical, rounded or obtuse at the apex, attenuated at the base, light green, coriaceous and shining. Sori round, uniserial. Fronds lateral, articulated on a scaly coepitose creeping rhizome.

↑ PLEOPELTIS, J. Smith.

5. P. percussum, J. Smith: Cavanilles.—An ornamental evergreen stove species, a Fig. 14. native of various localities in South America. Fronds simple, about a foot long, lanceolate-acuminate, cuspidate, coriaceous, bright green, shining, attenuated at the base, and covered throughout with minute peltate fimbriate scales. Sori large, uniserial, seated in dense compact tufts of narrow scales. Fronds lateral, articulated on a scaly creeping rhizome.

PHLEBODIA VER.E, R. Brown.

6. P. decumanum, J. Smith: Willdenow.—A glabrous ornamental evergreen stove species, from Jamaica, and various places in South America. Fronds slender, light green, pinnatifid, two to three feet long, with



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lanceolate-acuminate membranous segments, which are six to eight inches long, slightly serrated. Sori round immersed, uniserial. Fronds lateral, articulated on a scaly creeping rhizome.

7. P. aureum, R. Brown: Linnaeus.—A noble evergreen stove Fern, from the West Indies. Fronds glabrous, drooping, pinnatifid, three to rour feet long, with lanceolate-acuminate broad undulated membranous segments, which are eight to ten inches long, with entire margins. Sori round, biserial, or rather scattered. Stipes and rachis very smooth, shining, light brown or purple; lateral, articulated on a thick creeping rhizome, which is densely covered with bright brown scales.

8. P. sporadocarpum, J. Smith. (P. glaucum, Hort).—A very beautiful and glaucous evergreen stove species, from Mexico. Fronds in outline rather ovate, glaucous throughout, pinnatifid, with stiff coriaceous obtuse, almost lanceolate, repand, segments, with entire margins. Sori large, uniscrial, bright yellowish brown. Stipes very smooth, half the length of the frond, brownish green; lateral, articulated on a thick glaucous scaly creeping rhizome.

# CONTRASTS IN LANDSCAPE GARDENING.

By DAVID GORRIE, Esq.\*

CONTRASTS are used in the arts of ornamental gardening, painting, oratory, and poetry, for the purpose of heightening effect—of adding to the force of the forcible—and increasing the attractiveness of the beautiful. Instances of poetic contrasts are numerous in those standard productions of the Muse called classical; but one selected from an old traditionary ballad may be worthy. of notice, as indicating an acknowledgment of the principle even where a high style of art has not been attempted. A story in rhyme, regarding the "Burning o' the Bonnie House o' Airlie," begins thus:—

"It fell on a day, and a bonnie summer day,
When the corn grew green and rarely"----

And the calm rural loveliness thus depicted adds force to the succeeding tale of horror—a tale rendered all the more thrilling because of the insulting language said to have been addressed by the victor to the mistress of the doomed eastle:

"'Come down, come down, Lady Ogilvie,' he cried;

'Come down and kiss me fairly!'-

'I wadna kiss thee, cruel Argyle,

'Though ye leftna a stan'in stane in Airlie.'"

The effects of contrast in landscape scenery have not been passed over in silence by the pastoral poets. Thomson, indeed, describes the monotonous and unvarying scenery of those parts of England where hedgerows prevail in favourable terms; and Dyer, in his view from Grougar Hill, seems to have admired scenery of a similar kind, when he says—

"How close and small the hedges lie!
What streaks of meadows cross the eye!"

but in another part of the same poem it is rendered evident that he was alive to the charms of contrast, for he says—

"The gloomy pine, the poplar blue,
The yellow beech, the sable yew,
The slender fir that taper grows,
The sturdy oak with broad-spread boughs,
And beyond the purple grove,
Haunt of Phyllis, queen of love,
Gaudy as the op'ning dawn,
Lies a long and level lawn."

There are here the materials of a beautiful landscape, arranged in an effective manner—more effective than if the trees had been placed in hedgerows at equal distances over the face of the country, with narrow "streaks" of meadow-ground filling up the intermediate space, and no striking feature, no expanse either of light or shade, to form a leading and concentrating object. A recent French writer compares the monotony—the want of variety—caused by hedgerows dividing field from field, to the English character, about which he considers there is also something monotonous and unvaried. Whatever degree of aptness there may be in the comparison, it is certain that no landscape-painter would hesitate long if asked which of the kinds of scenery he would prefer.

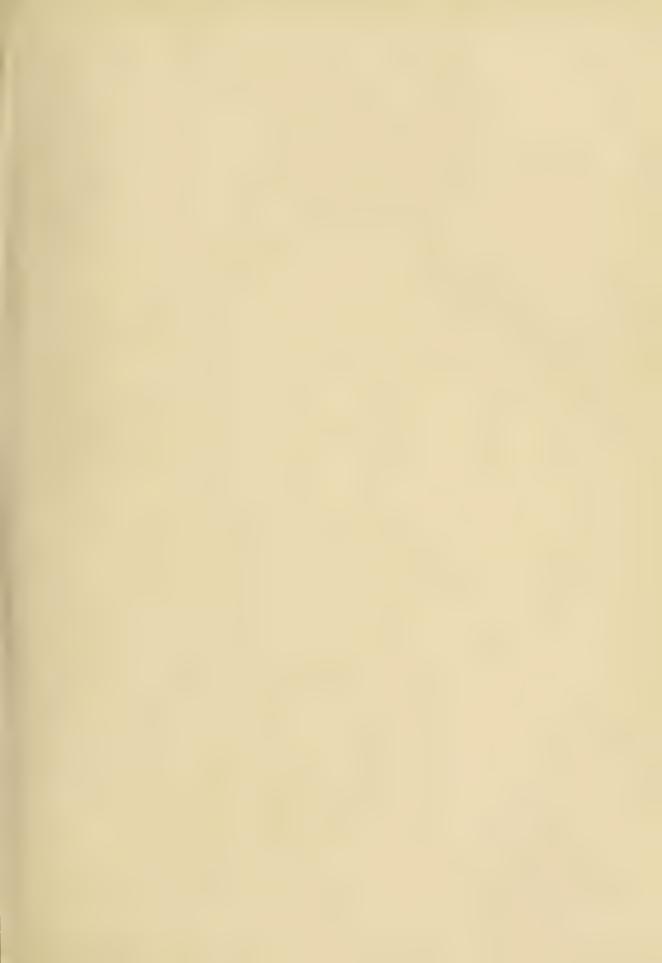
In park scenery, the dotting system, by which trees are scattered here and there over the lawn, is prejudicial to effect; and the ornamental gardener who knows the value of contrasts will provide unbroken expanses of grass in some places, to set off the scattered groups of trees in others, while both the grass and the scattered groups will add to the effect of an adjoining dense forest-like mixture of trees and shrubs. Ornamental planters are now generally aware of the fine effect that may be pro-

\* From the North British Journal of Horticulture,

duced by planting certain kinds of trees in masses, instead of mixing them in a manner which becomes monotonous through excess of variety, and which meets with no countenance in natural forests, since in them trees grow in masses of one kind, from the adaptation of the different kinds of trees to different soils and climates. In the flower-garden on gravel, contrast, in as far as the design of the beds is grass, the same effect is aimed at by clustering the beds near the walks, and leaving a breadth of grass unbroken by a single bed, or even by a solitary standard rose. In planting the flower-garden, contrast is produced in two main ways, the one botanical and the other dependent on the effect of colour. The first consists in planting shrubs and flowers in separate beds, and thus keeping ligneous plants entirely distinct from those of a herbaceous nature. The second way has been fashionable for some years. On its first introduction, the lovers of the promiscuous mode of planting defended that mode on the ground that the beauties of a flower should be judged of by inspecting that flower individually, and not in relation to others. Such objections, however, were soon overcome, and the plan of planting beds with flowers of one kind, and of thus producing contrast by separate masses of colour, so arranged as that two adjacent colours should be entirely distinct in their nature, soon found many advocates and practisers. Perhaps, however, its recent wide prevalence may have been partly the result of a desire on the part of flower cultivators to be "fashionable;" and if this has been the case, the system must be regarded, to a certain extent, as lacking in permanence, for experience testifies that there is no stability in the laws of fashion. It is of importance, therefore, that there should be a searching after first principles in this as in other matters. A labyrinthine maze of beauty may be formed by an indiscriminate mixture of flowers and shrubs, beds, gravel, and grass; but no high degree of art would be exhibited in such a scene. A flower-garden in the massing system is highly artistical, while at the same time it receives countenance from nature; for who has not admired the effect of a bank of cowslips, a mountain-side covered with heather, a grassy glade enlivened by a group of the early orchis, a brae-side yellow with the blossom of the broom, or an expanse of moorland adorned by the whin? Everywhere around us the beauties of nature are heightened by contrast; and it would therefore be an insufficient reason for giving up the system of planting flowers in masses because it had become unfashionable. There will be no permanency in the art of ornamental gardening while fashion is allowed to hold sway within the bounds of the garden or park.

# HORTICULTURAL SOCIETY.

February 18.—On this occasion a small plant of Rondeletia thyrsiflora, a very promising Ixoralike stove plant, with deep rose-coloured flowers, was exhibited by Messrs. Lee, of Hammersmith. A larger plant of the same, with a neatly-grown Centradenia floribunda, was sent by Mr. Gaines, of Battersea. Mr. Cole, gardener to H. Colyer, Esq., had a young plant of Allamanda neriifolia, which has lanceolate-acuminate leaves, arranged mostly in whorls of five, and bears terminal cymes of several yellow flowers, which, however, at this season, proved less attractive than those of species usually seen in cultivation; the plant appears to have a stiffer and more shrubby habit; and it is expected that, when bloomed in summer, it will prove much more showy. Two seedling Epacrises of some merit, came from Mr. Kinghorn, gardener to the Earl of Kilmorey; they were grandiflora rubra, and Kinghornii, and to the habit of grandiflora added, in the former case, much deeper crimson flowers with the white tips, and in the latter, flowers of a light rose-colour, with white tips; they were both bred from miniata. Mrs. Lawrence sent a nicely-bloomed plant of Cypripedium caudatum, and several other orchids, together with cut blooms of a splendid Heliconia, named brasiliensis, but apparently some other species; its rich crimson bracts and pure white flowers rendered it very attractive. Mr. Ingram, gardener to her Majesty, sent a magnificent mass of Begonia manicata; spoiled, however, in the transit, which this species will not bear. A fine tree of Camellia tricolor, one of the most showy of this family, was sent by Mr. Hamp, gardener to J. Thorn, Esq., of South Lambeth. Among the plants from the Society's garden were Acacia ixiophylla, a useful small kind for pot culture, and the too-little known plaited-leaved Snowdrop, Galanthus plicatus. Of fruits and vegetables, there were-from Mr. Fleming, well-preserved white Tokay grapes, with a dish of Muscats; and Cannon Hall Muscats were sent by Mr. Butcher, gardener to W. Leaf, Esq., of Streatham. Messrs. Rendle and Co., of Plymouth, sent some Brocoli, called Penzance, which was, no doubt, Adams's early white, finely developed in a Devonshire climate; and from the Society's garden were samples of the yellow Finland turnip, a small firm-rooted sort, apparently possessing little merit; variegated kale, more ornamental than useful; and Corn Salad, an old-fashioned salad herb, now coming again partially into use.





Fuchsias

Segreta Touriseur SExe

# FUCHSIA: FLORISTS' VARIETIES.

Nat. Order, ONAGRACELE (CENOTHERELE, Endlicher).

Generic Character.-Fuchsia, Plumier.-Flowers hermaphrodite, or sometimes polygamous by suppression. Calyx with the tube subglobose or ovate at the base, adherent to the ovary, constricted or thickened above the ovary, produced to a considerable length, funnel-shaped or cylindrical, coloured; the limb four-parted. Corolla of four petals, inserted at the top of the tube of the calyx, alternating with its lobes, almost equalling them or shorter, convoluted, spreading or reflexed at the margins, entire or two-lobed; very rarely absent. Stamens eight, inserted with the netals, in one row exserted, or in two rows included; filaments thread-like; anthers introrse, two-celled, incumbent, bursting longitudinally. Ovary inferior, fourcelled. Ovules many in each cell, inserted in several rows in the central angle, anatropous. Style thread-like; stigma capitate, with four grooves or four-lobed. Berry pulpy or dry, four-celled. Seeds

many in a cell, obovate-oblong, angular or rarely kidney-shaped; testa membranous, hilum basilar. Embryo exalbuminous, orthotropous and straight, or homotropously curved, with the cotyledons plano-convex, obtuse; radicle short, near the hilum. -Undershrubs or shrubs, sometimes arborescent, growing in the temperate and warmer parts of America, as also in New Zealand; leaves alternate, opposite or whorled, entire; peduncles axillary, one-flowered, solitary or aggregated, mostly nodding, rarely terminal, cymosely panicled; flowers carminecoloured, reddish, or more rarely rose-coloured.—(Endlicher Gen. Plant, 6125).

FLORISTS' VARIETIES :-

- Smith's Seddonii.
   Banks' Voltigeur.
- 3. Banks' Expansion.

ESCRIPTION, History, &c.—The varieties here represented were raised by E. Banks, ESCRIPTION, HISTORY, &c.—The varieties here represented by Esq., of Sholden Lodge, near Deal, who is an ardent cultivator of this tribe of plants. Seddonii was figured from the nursery of Mr. George Smith, Hornsey Road, and is a very beautiful flower. The tube and sepals are blush white, beautifully reflexed, and tipped with green, corolla violet purple, large and circular, and the flowers are produced in great profusion. This variety is much in the style of Venus Victrix, very considerably larger, and of free growth. Voltigeur and Expansion will be sent out by Mr. Turner of the Royal Nursery, Slough. The former is a dark flower of very considerable promise, of good shape and size, and distinct in colour; the corolla is rich purple, retaining its colour much longer than most of the kinds, the flower and plant of the same elegant habit as Formosa elegans, but of free growth, and the flower nearly double the size of that variety. Expansion is peculiar on account of the firm waxy appearance of the flowers, which are stout and of good shape. It blooms most profusely, retaining the flowers for a long time, and is of excellent habit. These flowers may be regarded as the best novelties that have been exhibited at the Metropolitan Exhibitions, and are perfectly distinct.

CULTURE.—We introduce under this head the following remarks on growing the Fuchsia for exhibition, by Mr. G. Glenny, which are much to the purpose:-

"This beautiful and graceful plant is from time to time shown at the great meetings, with less credit than any other in cultivation; because, perhaps, it is the easiest to grow, and comes rapidly to an exhibiting size. The mistake, as we have always said, is fast growth; but it is inexperience in the capabilities of the plant that often causes this carelessness. The great object seems to be to show plants as large as possible, and hence the forced growth. The Fuchsia ought not to be shown at one year old. The plant should be trained as carefully as a fruit tree; grown with a single stem for the pyramid form, and nothing cut away. It must not have heat at any time, and the first year all its growth should be made in the open air, as soon as the weather at the end of May admits of the plants being put out of doors. Here they grow naturally and ripen their wood; and all the care required is to cut out any branch that grows out of place, or where two are in each other's way. By the end of the summer the growth and bloom will be alike healthy; and the plant will be in character. If, when they begin to drop their leaves, they are put into a cold frame or pit, their wood will harden and their leaves drop; and, in fact, the plant will have done its work and may rest till spring, when it should be pruned as carefully as a wall fruit tree. In doing this, all the small weakly branches must be trimmed off close to the upright stem, and all the strong ones shortened to two or three eyes; the main upright stem is to be shortened enough to get rid of the weak point, and the plant is to be repotted in soil moderately good, such as loam and rotted turves one-half, and turfy peat one-half, well mixed together. There will be many more branches produced than ought to be retained, and when they have grown enough to show the direction they will take, those that are not wanted should be taken clean off, but such as grow outwards in all directions must be kept, that the plant may form a complete pyramid. On no account let them have heat; but turn them round a little every three or four days, that the growth may be all alike. Instead of the plants showing naked sticks and weakly dangling branches, they will, under this treatment, be well filled up and handsome. Avoid their getting drawn, which they will do, unless they have plenty of air. At the end of May they will be the bester for standing out of doors altogether; but let them be put in a place sheltered from wind, and vol., III.

on a hard substance, that the drainage may not be stopped, nor the worms intrude. When the roots protrude through the bottom holes of the pot, they may have a shift to pots a size larger. Continue to remove weakly and uscless shoots, and by no means let them become so thick as to hurt one another, but all should have room to show their flowers to perfection. When they begin to develope their buds, the plants may be removed back to the house, where they must be shaded from the extreme glare of the sun.

There will be as much difference between such plants, and those seen at the London shows, as there is between a crab and a pippin; and by this plan of growing and pruning, the same plants may be had year after year in the same perfection, without materially changing the size—although the size may be increased every season. Prune as before; but where you profess to remove shoots leave no snags, but cut smooth and close. This system of pruning will suit any style of plant—short and bushy, thick and conical, or a complete pyramid according to the habit of the variety; or it is as easy to train up as standards as to either of the other forms, if this is preferred, because you cut all off close to the stem as high up as you please, and leave the remainder to form the head, in which case, instead of pruning the branches at top quite close, you leave them six or eight inches long, retaining only such of the young shoots as will answer the purpose."

The best specimen Fuchsias we ever saw were exhibited at Leamington Spa in September last, and had been grown on this slow plan. The plants were perfect.—A.

# THE PROPERTIES OF THE FUCHSIA.

By Mr. G. GLENNY, F.H.S.

MHERE is now a universal admission among all classes of florists, that the globose form is the most desirable of all shapes for a Fuchsia; and we have laid down as a rule in "the perfection of

flowers," &c., that the bud of the Fuchsia before opening should be globular; but there are other points, founded on certain facts, which regulate this as well as some other flowers. For instance, the inside of the sepals is always of a more beautiful texture than the outside; therefore they should so reflex as to exhibit the inside surface only, and this can only be fully accomplished by the sepals turning back like the petals of the Martagon Lily—that is, curling back so as to form a ball, with the inside exposed, and all the corolla shown below. The texture of the sepals should be rich and smooth, not coarse and veiny. The corolla should have a rich velvety surface, and should be large and compact, with the pistil and stamens well exposed below it.

We object to any more tube than the sepals will cover when reflexed: in short, we want none, but if there be any, it should be as bright as the flower, shining like wax, and not more than half as long as the diameter of the clobe

the globe.

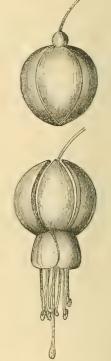
With regard to the colour of the Fuchsia, it is unnecessary to say more than that the sepals and corolla should be very different, and the stronger the contrast the better; light and dark shades of the same colour cannot be good. They ought to be not merely different shades but different colours: black and white, red and purple, white and purple, white and blue, white and scarlet.

The plant should be short jointed; the foliage small and bright; the stems thin, wiry, and elegant; the habit bushy and pyramidal; the flowers profuse at

the axils of all the leaves; and the footstalks long and elastic.

There is a style of form which we cannot lose sight of, we mean that which occurs in fulgens and corymbiflora. Now, although we cannot allow them to rank with the Florists' flowers, they may rank as flowering plants; and if they be grown as standards, the very long tubes are shown to advantage, but even these must have a contrast between the corolla and the tube. F. corymbiflora alba is the best of this class by far, because it possesses a beautiful contrast.

The three varieties now figured partake largely of some of the qualities we have mentioned. Expansion throws out its sepals at a right angle, and shows all the corolla. Voltigeur reflexes, and is, therefore, better, and if not so much nor so gracefully as we wish, it does more than a good many. Seddonii is very distinct, has some of the best qualities, and is a great acquisition to any group of half a dozen; in character it is perfectly novel, and novelty, in these matters, covers a multitude of faults. It is not only rich and unique, but it reflexes a good deal. We have not seen any very near approach to our chosen form, which is that in the diagram; but we hail every approach with great



pleasure; and having made all our standards as nearly as we could beyond the reach of florists, it has established one of the best tests that could be made, for every one can see which approaches the nearest-

# NOTES, CULTURAL, CRITICAL, AND SUGGESTIVE.

MANCY PELARGONIUMS (A. H.)—The disease you complain about is one that these high-bred varieties are very subject to. It is called *spot* and sometimes *gangrene*, and originates from various causes, such as unsuitable soil, a stagnant or humid and cold atmosphere, injudicious watering, and the use of impure and highly enriched soils; sudden changes of any kind will also induce it; and some varieties are constitutionally subject to it. When it presents itself in its most malignant form it is almost impossible to eradicate it or stay its progress; but if the plants are attended to directly it shows, it may be cured. In addition to the marks or spots upon the leaves, the plants will show brown marks upon the stem and foot-stalks of the leaves, and be exceedingly brittle and present a glossy, nay almost a glassy, appearance upon the surface of the leaves. This is its worst form, and the remedy to be taken is to shake the plants out of the soil, wash the roots if necessary, and repot in fresh turfy loam and leaf-mould, liberally intermixed with sand, and charcoal in small pieces. Place the plants in a warm and airy place, and water with great caution, until they get into good growth. Large plants, after they get into free growth, cannot so safely be shaken out, therefore remove as much soil as you can with safety and repot into the same compost, not forgetting the charcoal, as it is to its universally purifying influence that you must mainly look for success. When the plants are first affected, if taken in time, an occasional watering with lime-water and free ventilation will check the progress of disease; but it is almost impossible to eradicate it when fairly established. It is more than probable that the high breeding, or breeding "in and in," as is the case in the animal kingdom, has tended much to induce the disease, for it is quite certain nearly the same effects proceed from the same causes in the vegetable as in the animal creation; and so long as raisers of Pelargoniums continue to breed from the most delicate kinds, so long will this disease, which under such circumstances is constitutional, continue to increase. High breeding and high feeding among plants produce disease in the end, and if we are to "deserve success" more attention must be paid to the selection of parents, more especially the female parent. A short time ago we had plants of Field Marshal and Salamander much affected: they were potted and introduced into a temperature of 45' to 60', in which they have grown some inches in length, and are now quite healthy. The same experiment we intend to try with some other kinds.

Pimelea spectabilis (Querist).—The plant which you have just received from the nursery, if it is healthy and well-rooted, may be shifted at once into a larger pot, using a compost of two-thirds rich fibrous peat and one-third Epping loam, or if that cannot be procured any nice rich sandy hazel loam that can be met with, breaking both very fine, and mixing them liberally with sand and charcoal, and potsherds broken small. At the time of potting loosen the matted roots around the ball carefully, and shade the plant for a few days until it is established in the new soil. If the plant is in a five-inch, it is not, unless very thickly rooted, advisable to do more than to shift it into a large six-inch pot, but when it has filled that with roots, it may be removed into a nine or eleven-inch pot, being guided, of course, by the strength of the plant. At this time it will possibly be showing bloom, and if so do not stop it until it has expanded, as, if you do, it is almost certain to produce flower-shoots again; but if you allow it to bloom, and then cut it back, it will produce wood-shoots. Stopping must be systematically attended to: that is, stop all the shoots at the same time, but allow them to grow four or six inches long before doing so. The best situations for a Pimelea from this time until May is a house or pit a few degrees warmer than the greenhouse, and with a rather moist atmosphere, for most of the Swan River and New Holland plants like an atmosphere a little warmer, at all times, than the ordinary greenhouse, and cannot be successfully grown except in a warm house. After April give the plants plenty of air, syringe daily, water occasionally with weak liquid manure, shade slightly from the most scorching rays of the sun, and success is almost certain. To bloom P. spectabilis it is not safe to stop it later than the end of June, and then, to make sure, it should be exposed to all but the full mid-day sun throughout the autumn. Established plants, when they have done blooming, must be cut boldly back to within a few inches of the current year's shoots, and they should be kept in a shaded situation until the young shoots are an inch long. August is the best time to shift large plants. as, if re-potted in the spring, the flowers are liable to become deformed. Apply the usual remedies should the plants be attacked by red spider, thrip, or aphis. If you have not got them, you may add the following to your collection with safety:- P. mirabilis, a dark variety of decussata: Hendersonii; hispida; Neippergiana; Verschaffeltiana; macrocephala- all of which are very beautiful, and will succeed under the same treatment, if you persist in removing the flower-buds as they are produced. A.

# New and Rare Plants.

Cypripedium Atsmori, Morren. Many-leaved Japan Lady's Slipper (La Belg. Hort., i., t. 21).—Nat. Ord. Orchidaceæ & Cypripedieæ.—Syn., C. Calceolus, Thunberg; Atsmori so of the Japanese.—A leafy-stemmed hardy

perennial, growing about a foot high, with acute lance-shaped plaited smooth leave, and about two flowers, of which the labellum is yellow, slipper-shaped, or calceiform, and the sepals and petals rich purplish brown, the petals with purple hairs at the greenishyellow base. It is allied to the true C. Calceolus, according to M. Morren, from which it differs in having its leaves more lanceolate and glabrous, in the bracts being much more narrowly lanceolate and pointed, in the flowers being altogether narrower and more meagre, in the base of the petals being distinctly hairy, in the remarkable narrowness of the sepals, in the less ventricose pouch, cleft rather than toothed in front, in the lengthened trowel-like form of the sterile stamens, and in the longer filiform base of the lateral stamens. From Japan. Introduced by Dr. Von Siebold, in 1830, to Belgium. Flowers in summer. Probably cultivated in the Botanic Gardens of Ghent and Leyden,

Cypripedium guttatum, Swartz. Spotted-flowered Lady's Slipper (Flore des Serres, vi., t. 573). Nat. Ord., Orchidaceæ § Cypripedieæ.—A beautiful little herbaceous perennial. It has a short stem, bearing a pair of ovate-elliptic amplexicaul plaited leaves, with the margins and ribs hairy. The flowers, one to each stem, are white, beautifully blotched



1. Cypripedium Atsmori.

2. Cypripedium guttatum.

with rose-purple. The sepals and petals are shorter than the lip which is subrotund, with a plain surface. The

whole plant is under six inches high, the flowers measuring about two inches lengthwise. It grows in boggy places in cold countries, but appears shy under cultivation. From Siberia and North America. Introduced originally in 1828. Flowers in summer. M. Van Houtte of Ghent.

ERIA ACERVATA, Lindley. Heaped Eria (Journ. Hort. Soc., vi. 57).—Nat. Ord., Orchidaceæ § Malaxeæ-Dendrobidæ.—Λ stove epiphyte of no beauty. The pseudo-bulbs are compressed, and piled up closely together. The leaves straight and sword-shaped; the flowers small, white, with a tinge of green, two or three together in erect axillary racemes. From India. Introduced about 1849. Flowers in summer. Horticultural Society of London.

VERBENA TRIFIDA, Kunth. Three-cleft leaved Verbena (Paxt. Fl. Gard., i. 169).—Nat. Ord., Verbenaceæ.—A dwarf, herbaceous, half-hardy perennial, with sweet-scented flowers, but possessing little beauty. It grows about a foot high, and has four-cornered stems, stalkless opposite three or five-lobed leaves, and oblong hairy heads of pure white flowers. The fragrance is delicious; and it will probably give rise to a race of sweet-scented varieties, having the brilliancy of those now so generally grown as bedding plants. From Santa Martha, in New Grenada. Introduced in 1849. Flowers towards autumn. His Grace the Duke of Northumberland.

DAPHNE HOUTTEANA, Lindley. Van Houtte's Daphne (Paxt. Fl. Gard., i. 170).—Nat. Ord., Thymelaceæ.—Syn., D. Mezereum, fol. atropurpureis, of gardens.—A handsome hardy evergreen plant, with the leaves in part of a deep purple colour; lanceolate and half-leathery as in D. Laureola. The flowers are purple-lilae, and grow from the stem in little stalked cymes. Its origin is unknown. Dr. Planchon suggests it may be the D. papyracea of Wallich. Dr. Lindley asks, Can it be a mule between the Mezereum and the Spurge laurel? Introduced?—. Flowers in March, rather later than D. Mezereum.

Echinocactus streptocaulon, *Hooker*. Spiral-stemmed Echinocactus (*Bot. Mag.*, t. 4562).—Nat. Ord., Cactaceæ § Echinocactidæ.—A very distinct species, with an erect columnar habit, resembling a Cereus, and remarkable for its spirally-twisted stem. At Kew it grows a foot and a half high, and bears on the ribs of its stem densely crowded tufts of stout straight spines. The flowers are small, yellow, three or four issuing from the woolly crown at the summit of the stem. From Bolivia. Introduced by Mr. Bridges in 1844. Flowers in August. Royal Botanic Garden, Kew.

Schenia oppositifolia, Steetz. Opposite-leaved Schenia (Bot. Mag., t. 4560).—Nat. Ord., Asteraceæ § Tubulifloræ-Helichryseæ.—A lovely greenhouse annual, quite equal in beauty to the Rhodanthe Manglesii and Lawrencella rosea according to Sir W. Hooker's statement. It is an annual plant, with creet, unbranched stems, terminating in a broad corymb of showy rose-coloured flower-heads, each head being furnished with petal-like coloured involucral scales, spreading to the diameter of an inch, and resembling the radiant flowers of many composite plants. The real florets, which are tubular and yellow, form the "eye" or disk. The leaves are opposite, joined at the base, linear-lanceolate and acute. From Western Australia. Introduced in 1846 by Mr. Drummond. Flowers in spring or summer. Royal Botanic Garden, Kew.

Geranium Thunbergir, Siebold. Thunberg's Crane's-bill (Past. Fl. Gard., i. 186).—Nat. Ord., Geraniaceæ.—A prostrate annual weed, with five-lobed leaves, and two-flowered axillary peduncles, the flowers being small and purple. From Japan; and, we presume, introduced to this country, but this is not stated.

Acontum sinense, Siebold. Chinese Monkshood (Paxt. Fl. Gard., i. 187).—Nat. Ord., Ranunculacee § Helleboree.—A showy hardy perennial, growing about two feet high, with leaves deeply parted into five narrowish incised segments, and deep violet flowers resembling those of the common Monkshood. Dr. Lindley states that this and the allied A. autumnale are worth a greenhouse, in which, in Eugland, they are seen to most advantage. From Japan. Introduced in 1833. Flowers in autumn.

# PROGRESS OF HORTICULTURE, &c.

GUTTINGS in Brick Dust.—An American writer, who says he has lately had great success in propagating plants, thinks his good fortune due, in a great measure, to the material he uses, which is brickdust, such as may be made by pounding soft bricks. Daphnes, Heaths, Cape Jasmines, and plants difficult to root he has planted entirely in brickdust; more freely rooting plants in half brickdust and half sandy loam. Damping off rarely happens when this material is used; and it is surprising how certainly and quickly roots are protruded.—Horticulturist v. 284.

Analysis of the Apple.—Dr. Salisbury, of Albany (U.S.), gives the following as the result of an elaborate analysis of this fruit: 1000 lbs. of fresh apple contain about 827 lbs. of water. 170.4 lbs. of organic matter destructible by heat, and 2-6 lbs of inorganic matter or ash. 100 lbs. of fresh apple contain about 3·2 lbs. of fibre, 0·2 lbs. of gluten, fat, and wax, 3·1 lbs. of dextrine, 83 lbs. of sugar and extract, 0·3 lbs. of malic acid, 1·4 lbs. of albumen, 0·16 lbs. of casein, and 82·66 lbs. of water. 1000 lbs. of dry apple contain 17.18 lbs. of ash; 100 lbs. of apple ash contain, when deprived of carbonic acid, about 13 lbs. of phosphoric acid; 7 lbs. of sulphuric acid; 38 lbs. of potash; and 25 lbs soda; these four bodies forming about 83 per cent. of the whole ash.—Horticulturist, vi. 44.

Stocks for Conifera.—As regards a stock for Pinuses, nothing equals P. austriaca; it is hardy, robust in growth, transplants well at almost any age or size, and succeeds in any soil or situation;

all the Pinuses take and grow freely upon it. With this the Scotch fir (P. sylvestris) will not bear comparison; when potted the latter becomes stunted, it will not transplant freely, and grafts neither take nor grow well upon it. The Red Cedar (Juniperus virginiana) makes an admirable stock for the better sorts of free-growing Junipers; they take and grow freely upon it. I have reason to believe that on this stock many Cypresses would take and grow well. C. thurifera will grow splendidly upon it.—J. Saul in Jour. Hort. Soc. vi. 51.

Orchard-Houses.—This new name for cheap horticultural buildings, designed for the accommodation of "many fruits," is proposed in a half-crown pamphlet, which we strongly recommend to the notice of our readers. The author, Mr. Rivers, of Sawbridgeworth, has here opened up the question of cheap glass structures for the general cultivation of potted fruit trees. Leaving our readers and correspondents to discuss the utilitarian bearing of the question, we content ourselves, in this place, with a passing allusion to the gratification which such structures must afford the amateur or suburban gardener of small means. Cheap glass, root pruning, and pot-culture, are the principal elements, by the aid of which the proposed miniature glass-covered orchards are to be produced: economy is the key-stone of the system. "We have now cheap glass, cheap timber, and cheap bricks," and Mr. Rivers therefore concludes, that it is time to endeavour to neutralise the uncertainty of our seasons by glass; "for glass, without the least addition of artificial heat, will give us the climate, in average seasons, of the southwest of France; and what is of vast consequence, without the least hazard of injury from spring frosts." This is a matter of much importance, and one of Mr. Rivers's principal objects is to show how economically this safeguard can be provided in the form of rude buildings, which he had provisionally called glass-roofed sheds, but which are now permanently christened orchard-houses. Of one of them, thirty feet long by twelve wide, capable of accommodating about sixty bearing fruit trees, the estimated cost is £17 8s. 9d. The Orchard House contains a detail of the mode of construction, followed by instructions for the culture of Apricots, Peaches, and Nectarines, Plums, Cherries, Figs, Pears, Apples, Grapes, Mulberries, Strawberries, and a selection of sorts for this mode of culture. The profits of the publication (The Orchard House: Longman & Co.) are to be applied towards the repair of the parish church of Sawbridgeworth, on which point Mr. Rivers remarks: -- "I hope I may not be misunderstood. It is not ostentation that has tempted me to this, but a hope that I may be thus enabled to contribute a trifle towards the restoration of the church of my forefathers, and I trust of my children's children." The cultural directions which this pamphlet contains, are the records, Mr. Rivers tells us, of his own practice.—M.

Peat Charcoal is valuable as an element of manure, for which some of its properties eminently fit it. It appears to possess the property of absorbing gases to a very considerable degree, a power to which its peculiar open porous nature greatly contributes. The value of charcoal as a constituent of the soil depends almost wholly on its physical condition, for a dense charcoal, like plumbago, is of little or no use; and the more cellular and porous it is, the more serviceable it is to plants, acting as a constant magazine of gaseous food. Peat charcoal, for horticultural purposes, will probably be found of great use by the gardener, both as an addition to soils, and also in the formation of manures. In the preparation of various composts, and in reducing night-soil and similar fetid waste matters into a portable and convenient state, its value is considerable. That it can be so used with very great advantage there is no doubt; the only question is, whether it can be supplied at a sufficiently low price. It is the interest of those who make it to sell it at the lowest figure which leaves them a profit, and not to try and give it fictitious value, by comparing it with guano or any similar manure. Really good manures are not unfrequently altogether kept out of the markets by this foolish system of standing out for a fancy price, instead of looking only for a small profit and a large sale. As a disinfeeting agent, peat charcoal will be peculiarly valuable, because we are certainly still in want of a good, efficacious, and economical mode of removing the smell of night-soil; and a great deal of good manure which is now lost altogether would, no doubt, be saved and usefully applied, could its offensive odour be thus removed.—Gard. Chron., p. 84.

Rustic Baskets, of a very neat and artistic character, suitable alike for the plant-house or drawing-room, are manufactured by Mr. H. Howlett, gardener at St. Osyth's Priory, near Colchester, from the cones of the larch tree. They are hexagonal in form, and are suited either to stand upon a table or shelf, or to be suspended by chains also formed of larch cones, joined end to end, and terminating in a bow of cones. The basket or vase for enclosing the flower-pot is covered artistically, with similar cones, their small ends pointing outwards. For orchids, trailers, and other plants in pots, that look to the most advantage suspended from the roof, these rustic baskets are very appropriate and remarkably neat.—Cott. Gard., p. 300.

New Dahlias.-Those who wish to add to the beauty of their garden collection, will find but few

really novel colours; and the best-formed ones are, one and all, uncertain. The most striking colours are Baltic, a rich golden buff; Queen of Fairies, a singularly beautiful white, with a lavender or rosy lilac spot: neither of them are of first-rate form, but very beautiful in colour. Two novel whites, Queen of the West and Barmaid, are fine models, but not very certain; the former will be rather thin for the late season of showing, and the latter has a thin green scale in the centre, but occasionally comes without it. Admiral is a fine rosy lilac, something like very fine blooms of Fearless, Duke of Cambridge, and Queen of Lilacs, and apparently constant.—Cott. Gard., p. 381.

# Garden Nints for Amateurs.

ARCH is a busy month, not only among plants but also in the open garden and pleasure-ground; indeed the gardener who is not ahead of his work at the end of this month will generally find himself behind all the season; therefore exert yourself to complete alterations in every department, so as to make a good start with the coming month. In this busy season the matter of protection of fruit trees must be attended to in time, and even in late situations the retarding influence of shading during bright sunshine, by imitating late springs, which are generally fruitful, may be of considerable importance. At Elvaston, where there is the best wall of Apricot trees perhaps in England, Mr. Barron commences protection in October, by placing frames covered thinly with a network of haybands before the trees at that time. If the young wood is not thoroughly matured it is protected from the scourging effects of a severe winter; and if the buds are too forward in the autumn, the shading of the wall will retard and bring them to their right season in the spring. This is the true theory of fruit protection. A very sensible article on the subject will be found in the Journal of the Horticultural Society (vol. v., p. 277), by our contributor, Mr. John Saul.

If the directions of last month respecting the potting of all plants which require shifting have not been attended to, no time must be lost in carrying them out, for the easterly winds will soon be upon us, and nothing is so injurious to newly-potted plants. When the plants are potted the houses must be kept close for a fortnight; that is, the plants must not be exposed to cold draughts, and consequently, the house must not be ventilated by the top and side lights at the same time. A syringe full of clean tepid water may be drawn over the plants occasionally on bright mornings, and plants in towns or exposed to dust, will be materially benefited if they are taken from the house some mild dry day, and receive a thorough washing, as recommended at p. 38. Cleanliness is the life and vigour of plants; without it success in their cultivation is impossible. They may live and grow, but it will be the smoke-dried growth of the children of the close and ill-ventilated courts of our crowded cities, and not the robust health of country life. Watering, more especially among specimen plants, will require particular attention; in fact, each plant must be examined separately, and if you have any doubt of the ball not being moist throughout, probe it directly with a thin-pointed iron rod, and place the pot in a feeder of water until the ball is properly moistened: this must be attended to at once, or the parching winds of March may acquaint you of your neglect when it is too late, and the plant has paid the debt of nature. Azaleas and Heaths must be particularly attended to in this respect, or the flowers may come small, blind, and deformed, if they are not destroyed altogether. If you grow plants for exhibition, or if you require to retard, or force any plants for a particular time, you must examine your stock minutely, and see which plants will be the best suited for certain times, and arrange them accordingly; those that require forcing in the warmest and most sunny parts of the house, and those to be kept back in the shaded parts. About the end of the month any plants which have not been repotted, and which are advancing into bloom, will be benefited by a little weak liquid manure, prepared from sheep's dung and soot steeped in soft water. Do not forget to use it weak.

Among soft-wooded plants increase the temperature of the Pelargonium-house a little, more especially if you grow "Fancies," so as to draw the shoots out a little before they begin to truss up for bloom. Any that are forward must have the flowers picked out, so as husband the strength of the plants for the general bloom. Scarlet Pelargoniums for specimen plants must be attended to, and have additional heat. Fuchsias must be forwarded in a warm pit; the varieties figured in another page are splendid kinds. Calceolarias are now growing admirably; repot if necessary, and attend regularly with water, and to the destruction or prevention of insects. Cinerarias become daily more interesting, as the flowers begin to expand, and those who have a batch of seedlings will find them of hourly interest. All soft-wooded plants, not in bloom, will be benefited by syringing with soft tepid water, twice or thrice a week.

In the Store the plants will require daily attention. Maintain a moist-growing temperature, increasing it weekly a degree or two as the plants progress in growth, and syringe every clear morning. Introduce Bulbs, American plants, and Roses for succession, and start towards the end of the month some more Achimenes, Gloxinias, &c. Those who grow Æschynanthuses will find the old grandiflora very useful; suspended from the roof of a stove, or in the window of a sitting-room, it is an exceedingly beautiful and interesting plant. The system of growing plants of pendent habit in neat baskets is much to be commended, and such things as Achimenes and Gloxinias, either separately or mixed with a few plants of Lycopodium denticulatum or stoloniferum to cover the soil, have an exceedingly interesting appearance. Clerodendrons must be started if you have heat enough for them, cutting them down previously, and shaking them clean out of the old soil; and that fine old plant, Gloriosa superba and the yellow species, should also be started in a brisk bottom heat. Do not be too neat with your climbers in pots, a little rude growth will do them good. Schubertia graveolens, if not started before, should now be put into bottom heat.

In the *Propagating Pit* every inch of space should be occupied with stock for the flower-garden, and probably a nice dung-bed with a two-light box will be found a useful adjunct of success. If the young wood is in free growth, do not stand about cutting soft things to a joint; secure one leaf-bud and part of the internode, and that is all you require. Every joint will make a plant now if properly treated. Maintain a brisk growing temperature by renewing the linings when necessary, but guard

against rank steam by tilting the lights slightly, every night, as a safety valve.

Plants in Cold Pits and Frames cannot receive too much air, but it will be well not to expose them to heavy rains at present, lest after this mild winter a change should come at the eleventh hour. Repot any Stocks that require it, using a good rich soil, and attend to the young stock of Mignonette; thin it in time, but not too much at once. Sow some Stocks for planting out, in a spare light, and any other annual flowers that are wanted early.

Among Florists' Flowers pursue nearly the same treatment as last month, and finish the potting of Carnations and Picotees, if not already done. Auriculas and Polyanthuses will now be throwing up for bloom; give them plenty of air, but avoid cold draughts, which will cause the flowers to come crumpled. Top-dress the pots, if not already done, and water when necessary, giving the plants the advantage of a slight shower on warm mornings. The propagation of Dahlias must be attended to when a large stock is required, as must also that of Hollyhocks and Phloxes. Tulips where forward will require protection in case of a change to severe weather; and Ranunculuses or Anemones breaking through the ground must be attended to.

In the Flower Garden the mowing of the grass for the first time must not be delayed, as upon cutting it closely now much of its beauty during the summer will depend. Do not forget that uniform and shallow edging, smooth turf, and walks brimfull of good gravel, are the main characteristics of a well-kept English garden. They are the envy of our continental neighbours, and as a good many of them are coming to see us in the spring, let us increase their envy in this respect if possible. Sow the first batch of hardy annuals, and a good lot of Sweet Peas, Lupines, &c., for cut flowers. Autumn-sown annuals may also be planted out, as may herbaceous plants for the borders. Turn walks, clear away rubbish, and make all neat and clean.

Forcing Garden.—If the bed is in a fit state and the plants ready, the cucumbers may be ridged out, but take care of overheating and rank steam. A bed must also be prepared for Melons, and some seed must be sown. The Trentham Hybrid and Bromham Hall, with the Dampsha, noticed at another page for a late crop, are perhaps the most useful. Attend to Sea-kale and Mushrooms. Sow successional crops of small Salad: and a little Cole's Red Celery, on heat, under a hand-glass, about the middle of the month. Keep a stock of fermenting dung, but any you have to spare may be used for another hooped bed for Early Potatocs.

Kitchen and Fruit Garden.—If the directions of last month have been attended to the pruning of fruit trees will have been completed, the trees nailed, and the main crops of early Potatoes planted. Lose no time in getting the later kinds planted, but avoid planting those generally called late. The main crop of Onions, Parsnips, and Carrots must be sown towards the end of the month, and successional crops of Peas and Beans. Sow Radishes, Spinach, Lettuce, Cabbage, a little early and Walcheren Cauliflower, purple branching and Cape Brocoli, and in late situations the general crop of Brussels Sprouts, Savoy, curled Kale and Brocoli at the end of the month. A good breadth of Parsley must also be sown, and herbs of all kinds, either in heat or upon a sheltered border. Attend to Cauliflowers under hand glasses, plant out the main crop, and also a piece of Cabbage, for succession. Destroy snails and insects of all kinds. When the roughest of the work is completed, repair and clip Box edgings, turn walks, and make all neat and clean.—P.





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#### FRANCISCEA CONFERTIFLORA.

Nat. Order.—Scrophulariaceæ, Benth. (Atropaceæ, Miers).

GENERIC CHARACTER.-Franciscea, Pohl. (amended character.—Calyx inflated-tubular, the mouth oblique, five-toothed. Corolla salver-shaped, the tube narrow, slightly inflated at the back at the summit; limb oblique, rotate, spreading, fivetoothed beyond the middle, segments unequal, rounded, entire, uppermost largest, quincuncially imbricate in estivation, with the sinuses introflexed. Stamens four, didynamous, included, short, inserted in pairs below the dilatation of the tube, the longer two below the largest uppermost lobe; filaments rather fleshy, compressed, corrugated, inflexed at the apex; anthers kidney-shaped, affixed by the sinus, one-celled, opening by a two-valved marginal slit, globular polleniferous receptacle conspicuous in the sinus. Ovary obovate, surrounded at the base by a stalked fleshy gland, two-celled; placentas fleshy, prominent, adnate on each side of the dissepiment, with many ovules; style filiform, very much thickened and inflexed at the apex; stigma two-lipped, lobes short, rather thick, obtuse, glandular within. Capsule ovate, included in the persistent calyx, leathery, two-valved, two-celled, valves parallel to the

finally free placenta. Seeds few, rather large, oblong, subangular, convex on the back, hilum ventral, conspicuous, hollow; testa reticulately pitted. Embryo contrary to the hilum, incurved in the axis of fleshy albumen; cotyledons ovate, compressed, one third the length and twice as broad as the terete, slender, inferior radicle.—Brazilian and Peruvian under-shrubs; leaves alternate, entire, oblong; cymes terminal, densely capituliform, or loosely few-flowered, more rarely reduced to a single flower; bracts small; flowers showy, violet, sometimes paler; tube of the corolla about equal to the calyx, more rarely twice or three times as long.—(Miers. Annals of Nat. Hist. 2nd Series, v. 249).

Franciscea confertiflora, *Pohl.*—Crowded-flowered Franciscea.—Leaves oblong, acuminate or obtuse, glabrous or more rarely slightly hairy above, slightly hairy or villous beneath; cymes loosely many-flowered; calyces tubular, scarcely inflated, villous, tube of the corolla slightly exserted.

SYN.-Brunsfelsia confertiflora, Bentham.

ESCRIPTION.—An ornamental shrub, with round smooth slightly-branching stems, clothed with a brown canescent epidermis, easily disturbed. Branches leafy, sub-erect, with an epidermis like the stem, slightly hairy under a lens, lutescent-hairy at the summits. subsessile, oblong, acute or obtuse, attenuated at the base, quite entire, rather scabrous on both faces, and occasionally slightly hairy; dull yellowish green above, sometimes brownish beneath, veined, membranous, flat, scattered, rather crowded at the summit of the young branches, erecto-patent, three to four inches long, one to one and a half inch wide; leaf-stalks very short, subterete, ferruginous, with few hairs. Stipules wanting; cymes irregular, crowded, terminal, rather oblong. Peduncles very short, terete, thread-like, bracteate, rather swollen and deciduous at the articulation, hairy. Bracts very minute, lanceolate, caducous. Bractlets oblong, attenuated at the base, sessile, hairy, deciduous. Calyx inferior, persistent, inflated, campanulate, five-toothed, hairy, tube about equalling the corolla. Corolla lilae, salver-shaped, tube slightly hairy under a lens. Filaments dilated at the base, rather flat, rounded above, retuse; anthers didynamous, connivent, simple, oblong, incurved, emarginate at both ends. Ovary superior, sessile, cylindrically conical; style club-shaped, incurved at the apex, stigma two-lobed. Capsule rounded ovate, two-celled, two-valved. Seeds numerous.—A. H.

History, &c.—A native of Brazil, in the provinces of Rio Janeiro and Minas Geraes. Our drawing was made from a plant which bloomed in the establishment of Messrs. Henderson, Pine Apple Place, Edgeware Road, in November last. It appears to have been in the country about a couple of years, and to have been received by way of the Belgian gardens.

CULTURE.—Since the time the old Franciscea Hopeana was introduced, this has always been a favourite family of plants with most cultivators, not less for its easy culture than for the great profusion with which most of the species produce sweet-scented flowers; for with proper management some of them may be had in flower every week in the year. To grow them properly, they must have plenty of heat and moisture; but when established, and the wood properly ripened, they will live in a temperature a little in advance of the ordinary greenhouse. The best soil is turfy peat, loam, and leaf-mould, in equal proportions, liberally intermixed with sand and charcoal. When the plants are thoroughly established, shift them liberally, but take care to get abundance of roots before you indulge in large pots. Water occasionally with manure-water, syringe daily, and keep a brisk bottom heat-dung heat is the best, if it can be had. When the plants are established, they should, before starting them the second time, be cut boldly back, and the young shoots must be trained into proper shape to form a good plant; stop the young shoots as they progress in growth, and take care to keep the plants clear of insects. Old established plants, after they have been cut back and formed shoots an inch long, must have the ball reduced and be potted in fresh soil, using pots as small as possible, so as to admit of liberal shifts in the growing season. Of course the plants must be kept close, and the pots be plunged in heat until they are properly established.—A.

# Elegetable Ihnsialagn.

BY ARTHUR HENFREY, Esq., F.L.S., LECTURER ON BOTANY AT St. GEORGE'S HOSPITAL.

MHE task of the physiologist is the investigation and determination of the laws of life; that is to say, his object is to lay down rules or general principles describing the invariable succession of facts in the history of what we call living bodies. Thus, when we say it is a law of vegetable life that "the lower or simpler the organisation of a plant is, the more independent are its alimentary parts of one another," we express merely our belief in the invariability of the occurrence of certain series of facts, which always have succeeded one another in a certain order, so far as our experience enables us to judge; namely, that when we divide a simple plant like a Conferva, composed of single rows of cells, into lengths containing one or two cells, without injuring them, or when we see such plants becoming spontaneously divided into such pieces, we find that each piece can continue to live and grow,—while, if we take a vegetable of complicated organisation, such as any flowering plant, we can only divide it into as many pieces or slips as there are buds upon it, with any chance of obtaining a distinctly independent plant from such piece; these buds being, of course, complicated structures, containing thousands of cells of varied form and consistence.

Now, there are few subjects on which greater variation of opinion exists, than on the nature and peculiar characters of this life, a want of agreement which may without hesitation be attributed to our ignorance. There exists in every department of science, except astronomy,—where we have attained to the conception of a single primary force, namely, gravity,—a large volume of facts which refuse to be arranged under the laws of the forces or secondary causes with which we are acquainted. This is particularly the case in the study of organized nature; we are all acquainted with a vast number of facts which we cannot connect by any definite chain of causes with well-defined forces, and we say, for the moment, that they depend upon the exertion of vital force: using this term so vaguely, that it is to all intents and purposes a confession that we do not know the cause. The vital force is made to account for the residue or balance of facts which remain unexplained, that is unconnected with our knowledge of the other parts of nature. The great progress of chemistry during the last few years, and the extensive application of its conclusions that we have been able to make in vegetable physiology, have gone far in analysing and breaking up into separate, well-defined notions, the general idea of the vital force of vegetables, taking a large number of facts out of the domain of vitality, and bringing them under the laws of chemistry and physics. A result of this has been, especially among chemists totally devoid of detailed knowledge of the phenomena of vegetable life, the acquisition of an idea that no such thing as a special vital force exists, and that all the so-called phenomena of life may ultimately be referred to physical causes. This is a simple consequence of looking only at one side of the question, and an illustration of the ill effects which may arise from the too great tendency to devote the mind to a single pursuit. The division of labour in science is a very different thing from the division of labour in the arts; in the latter, men have to do with material objects which pass unchanged from hand to hand, but in science we have to do with ideas, which cannot be conveyed accurately and fully by words alone, except in regard to objects having the fewest possible qualities, qualities which the daily experience of life has made familiar. Even here, in daily life, no man could convey to another an idea of a blue or red colour if that other had not previously seen those colours and learned their peculiar names; how much less, therefore, can accurate ideas of such complicated objects, having such refined distinctions as occur in organic structures, be conveyed by words to those who have had little or no experience to give them a knowledge of the peculiar qualities,—to speak familiarly, "to give them pegs on which to hang their ideas?" Hence the one-sided view of Mulder and his school, who have done so much to enlighten us on the chemistry of vegetation. To use the words of Prof. Schleiden, they have forgotten that "cellulose is not a cell." The organic form-different, but in each case absolutely fixed in hundreds or thousands of instances, in which chemical analysis can point out no distinction—at once marks the presence of some force over and above the physical forces.

When, however, we come to the study of the phenomena of vegetable life, we find them so complicated, we find various changes so dependent upon physical and chemical agencies, that it becomes our first object to investigate and determine the influence of these as conducing to the effects. The residual facts to be attributed to vitality are so few and so little within the sphere of our comprehension, manifesting themselves only in the phenomena of form and continual change, that the greater part of our labour in the inquiry into the laws of vegetable life, resolve themselves into chemical and physical investigations, the peculiar characteristic phenomena of vitality in vegetables lying chiefly in the domain of morphology. Animal life presents a more complex condition; there we have a high complication of living forms, and physiology has to deal with a great variety of organs, and what are called

systems of organs, devoted to special purposes. But in plants, when we except the reproductive organs, all the rest of the plant is composed of distinct cells or elementary parts, each a little chemical laboratory in which are composed the substances out of which new productions of form are to be constructed: and cells having the same office (with the exceptions of those in the reproductive organs where there is great variety), may be said to be alike in all plants. Thus, for the study of physiological botany, it is by no means necessary to be acquainted with all the varieties of general form and their morphological relations so infinite in the vegetable kingdom: all we require is, an intimate acquaintance with the characters of the elementary tissues in general, and, in a given inquiry, of their peculiar arrangement and distribution in the particular plant whose life we are engaged in observing.

For a thorough comprehension of vegetable physiology, it is indispensible to possess an intimate practical acquaintance with the microscopic anatomy of plants; and had such been possessed by many who have laid down laws which have had wide acceptance, those now pursuing the science would have been spared many contradictory and bewildering statements, taken up at first on what is supposed sufficient authority, and only rejected after long and painful investigation, which might have been better employed in independent inquiry, setting out from the lower point at which our positive knowledge actually stands. It should be a rule with every vegetable physiologist to believe himself to know only what he himself has actually seen. Of course, he must not cast away the help of others, or lightly disregard the accumulated treasures which descend to him from his predecessors: but these things must always be taken on qualified trust, as things to be tested by his own experience, and, on the other hand, as tests of his own accuracy of observation. On the one hand, unless he has investigated and weighed their value practically, he has no right to use the theories of others as data for his own reasoning; and, on the other hand, he must not be led to reason from observations of his own, to conclusions that involve contradictions of facts observed by others, until he has made a thorough and complete examination of the grounds upon which these facts have been stated. The great rule to be observed, and that which will enable every one whose occupations take him daily among living plants, to furnish valuable material to science, is to limit his reasoning to the conclusions legitimately deducible from the facts that he himself observes. Thus, supposing a person to make a series of measurements of the growing stems and branches of different trees, at various seasons of the year, it is no business of his, and can be of no value to science, to argue about the movements of the sap, on the grounds of the increase of size, unless he has also practically examined the internal structures, and can demonstrate a relation between their changes and those of the external form. He may speculate if he will, and such speculations may be useful as such, and lead to inquiry, but such a proceeding does not add to our positive knowledge, and we must always mark very broadly the difference between "it may be so" and " it is so."

These points have been thus largely dwelt upon because there is such a mass of speculation included as knowledge in all works on physiological botany, and because we really know so much less than is commonly imagined. They have been dwelt upon in the hope of impressing the necessity of direct, practical, and above all, cautious examination of facts, so many of which fall within the daily experience of horticulturists. With the exception of a few great names, the chief writers upon vegetable physiology have had but imperfect opportunities of observing living nature day by day, with that close attention and comprehensive view which is requisite to sound generalization. Most of those who have written general treatises upon the subject, have been dependent on the relation of others for the great body of their information, and, unfortunately, have been only too prone to draw general conclusions from these second-hand ideas, without a sufficient practical criticism of them.

In making the foregoing statements, I have anything but a desire to east blame upon the intentions of others; and, indeed, in here writing upon the subject, I lie inevitably exposed to fall into the very same error. They are rather given with a view to explain the sceptical character which will probably be manifest in some of the succeeding papers, and direct attention more forcibly to the imperfect and unsatisfactory state in which this department of the science lies, in the hope of stimulating the activity of those who have an opportunity of adding to our knowledge, and, at the same time, of impressing the absolute necessity of extreme caution and self-denial in following out our hypotheses, if we wish to contribute anything really valuable and permanent to the general fund of positive science.

# New and Rare Plants.

Ornitharium striatulum, Lindley. Streaked flowered Ornitharium (Paxt. Fl. Gard., i. 188).— Nat. Ord., Orchidacem § Vandee-Sarcanthidae.—Syn., Ornithochilus striatulus, of the Calcutta Garden.—A stove epiphyte of little beauty. It has two ranked pale green leaves, notched at the end, and axillary spikes of small, wavy.

yellow flowers, marked with a few red bars, the lip white, with a few violet stains and a deep purple round knob at the end. From India. Introduced in 1847. Flowers in October. W. F. G. Farmer, Esq., Nonsuch Park, Surrey.



CAMPANULA VIDALII, Watson. Capt. Vidal's Bellflower .- Nat. Ord., Campanulaceæ § Campanuleæ.—A half-shrubby maritime Bellflower, probably half hardy or requiring a greenhouse. It is described to us by a gardener well acquainted with English flower-gardening, as a very ornamental species. Our figure, which serves merely to show its form, is taken from a representation of a poor specimen in Hooker's Icones Plantarum (vii., t. 684). The plant forms a roundish mass two feet high, having dichotomous thickened branches which terminate in a rosette of leaves, of half-succulent, half-leathery texture, smooth, spathulate-oblong, with revolute crenated margins; the few leaves which occur on the flowering stems are lance-shaped and nearly The flowers grow entire. in terminal racemes, which shoot out from the centres of the leafy rosettes; they are nodding, bell-shaped, contracted in the middle, white or cream-coloured. Mr. Watson describes the leaves and branches as recalling to mind some species of Saxifraga or Sempervivum; in his dried specimen, shown in our figure, on which about three flowers were developed, several flower-buds appeared abortive, or else would have been developed later and irregularly. We have raised seedling plants.-From the Azores; found on an insulated rock on the east coast of Flores by Capt. Vidal. Introduced in 1851. Flowers through the summer. Mr. Ayres, of Blackheath.

CAMPANULA COLORATA, Wallich. Deep coloured Bell-flower (Bot. Mag., t. 4555).-Nat. Ord., Campanulaceæ & Campanuleæ.-

A pretty little trailing perennial species of Bell-flower. It has slender branched angular stems from a span to two

feet long, bearing remote alternate ovate-lanceolate, almost sessile leaves, and numerous terminal and axillary flowers which are bell-shaped, with a spreading limb an inch across, and of a deep purple colour. Being of trailing habit it would be suitable for planting on rockwork. It seems hardy, but it is recommended to keep the plants in a dry frame during winter. From Sikkim-Himalaya, at an elevation of 10,000 feet. Introduced by Dr. Hooker in 1849. Flowers in autumn. Royal Botanic Garden, Kew.

TILIANDSIA INANIS, Lindley. Empty-bracted Tillandsia (Paxt. Fl. Gard., i. 159).—Nat. Ord., Bromeliaceæ.—A very curious and rather pretty stove epiphyte, with the habit of T. bulbosa. The broad bases of the lower leaves are closely imbricated, and enlarged into a kind of bulb. The leaves are narrow, dry, twisted, and recurved, the edges much incurved, so that they become grooved; they are from six inches to a foot long, green, closely covered with brownish-red blotches, and speckled with minute white scurfs. The scape is about six inches high, closely embraced by the bases of the cauline leaves; at top it bears several oblong acuminate bracts of a brilliant red, from the third and fourth only of which from the top, two narrow erect tube-like flowers of a purplish lilac colour, and rather more than an inch long, are produced. From Bucnos Ayres, high up the Parana. Introduced in 1841 by Commodore Sullivan. Flowers in spring. Sir C. Lemon, Bart.

TILLANDSIA EMINENS, Lindley. Tall bulbous Tillandsia (Paxt. Fl. Gard., i. 160).—Nat. Ord., Bromeliaceæ.—A stove epiphyte related to T. bulbosa, differing in having its leaves shorter than the flower-spike, which is leafless, branched, and composed of numerous two-ranked crimson-keeled naked bracts. From St. Domingo. Introduced?

TILLANDSIA PUMILA, Lindley. Dwarf bulbous Tillandsia (Paxt. Fl. Gard., i. 160).—Nat. Ord., Bromeliaceæ.—A stove epiphyte, closely related to T. bulbosa. It has a peculiar lumpish habit, and an abundance of very coarse loose seurfs spreading up to the very points of the outer bracts, which are not coloured; it has, moreover, a nearly simple flower-spike, sessile among the leaves. From Para. Introduced?

Aster sikkimensis, Hooker. Sikkim Michaelmas Daisy (Bot. Mag., t. 4557). -Nat. Ord., Asteracee § Tubulifloræ-Astereæ.—A showy hardy perennial, with an erect almost woody stem, three or four feet high, bearing glabrous, lanceolate acuminate, spinulose serrate leaves, and large corymbs of showy purple flower-heads. The stems form almost perfect wood the first year, but, as these are killed down during our winter, it seems to assume the character of a perennial herbaceous plant. From the Alpine regions of Sikkim. Introduced by Dr. Hooker in 1849. Flowers in October. Royal Botanic Garden, Kew.

Gynerium Argenteum, Nees. The Pampas Grass (Paxt. Fl. Gard., i. 175).—Nat. Ord., Graminaceæ § Arundineæ.—Syn., Arundo Selloana, Schultes.—One of the few grasses which may be considered ornamental. This is a tall reedy perennial, rivalling the bamboo in stature, and having hard wiry rough-edged, grey-green leaves. The flowers are in panicles from a foot and a half to two and a half feet long, of a silvery whiteness, and forming erect silky plumes. It is apparently quite hardy. From Brazil. Introduced in 1846. Flowers towards autumn. Botanic Garden, Glasnevin.

ADENOSTOMA FASCICULATA, Hooker and Arnott. Bundle-leaved Adenostoma (Journ. Hort. Soc., vi. 55).—Nat. Ord., Sanguisorbaceæ.—A small heath-like shrub growing about two feet high; its hardiness has not been tested. It has slender upright branches, bearing linear concavo-convex, sharp pointed, two or three-lobed leaves, arising in tufts from the axils of the first leaves, soon falling, and leaving behind a pair of spiny stipules. The flowers are small, white, arranged in terminal panieles. From California. Introduced by Hartweg about 1848. Flowers in summer. In point of beauty inferior to the Spiraeas. Horticultural Society of London.

Consolida Aconiti, Lindley. Aconite-like Branching Larkspur (Journ. Hort. Soc., vi. 55). — Nat. Ord., Ranunculaceæ § Helleboreæ.—Syn., Delphinium Aconiti, Lindens.—A slender erect branching annual plant, growing a foot and a half high, slightly hairy. The leaves are divided into from three to five pedate linear-pointed lobes. The flowers come in loose straggling racemes, on long stalks; they are of a deep bluish lavender colour, and consist of five oblong sepals, of which four hang downwards, the fifth extended into a horizontal blunt hairy spur, the two petals are united into a fleshy spur enclosed within the fifth sepal. From Erzeroum. Originally introduced in 1801; re-introduced in 1849 by H. Calvert, Esq. Flowers in summer. Horticultural Society of London.

Oncidium luridum, atratum. Dark lurid Oncid (Journ. Hort. Soc., vi. 54).—Nat. Ord., Orchidaceæ (Vandeæ-Brassidæ.—A fine stove epiphyte, with the habit and appearance of O. luridum, but having smaller flowers, very flat, with olive and rose-coloured sepals and petals, and a rich crimson lip furnished at the base with five purple-black tubercles. From Tampico. Introduced by Hartweg about 1847. Flowers in summer. Horticultural Society of London.

Oncidium Velutinum, Lindley. Velvety Oncid (Paxt. Fl. Gard., i. 166).—Nat. Ord., Orchidaceae § Vandeæ-Brassidæ.—Syn., O. variegatum, Lindley in Orch. Linden.—A pretty stove epiphyte, nearly allied to O. variegatum; having acute fleshy equitant serrulate leaves, and velvety panicled rose coloured flowers, of which the back sepal is obcordate, the lower united into one spoon-shaped body; the petals are nearly orbicular, the lip having small rounded lateral lobes, abruptly passing into the broad two-lobed middle division. From Cuba. Introduced (probably) by Mr. Linden in 1848. Flowers in summer.

Oncidium Planilabre, Lindley. Flat-lipped Oncid (Journ. Hort. Soc., vi. 59). Nat. Ord., Orchidaceae § Vandea-Brassida.—A rather pretty stove epiphyte in the way of O. Suttoni and O. flexuosum. The pseudo bulbs

are sharp edged, thin, and ribbed at the sides. The leaves sword-shaped, and shorter than the raceme, which is long and narrow; the flowers have dull brown sepals and petals tipped with yellow, and a clear yellow lip stained with cinnamon-brown at the base; the former are rhomboid-lanceolate wavy and stalked, the latter three-lobed, the centre lobe nearly hemispherical, emarginate, and perfectly flat. From Brazil. Introduced about 1849. Flowers in August. Horticultural Society of London.

Cœlogyne Trisaccata, Gristith. Trisaccate Cœlogyne (Paxt. Fl. Gard., i. 183).—Nat. Ord., Orchidaceæ § Epidendreæ-Cœlogynidæ. A stove epiphyte, with obovate club-shaped pseudo-bulbs, obovate lanceolate five-ribbed leaves, and having six or eight large flowers, arranged distichously in a nodding raceme; they scarcely expand except at the point, and are white except the tip of the lip, which is sulphur yellow. From India: woods at Mamloo, in the Khasijah hills. Introduced about 1850. Flowered in winter with M. Pescatore.

## CONTRIBUTIONS TO THE AQUARIUM.

By Mr. George Lawson, F.R.P.S., F.B.S.E., Assistant Secretary and Curator to the Botanical Society of Edinburgh.

ON the 9th of November 1849, and in the ducal gardens at Chatsworth, the Royal Water Lily of South America expanded the first gorgeous blossom which it had produced in Europe. opening of that flower was a great event in floral history, a high achievement in the art of gardening; and the tidings were soon heralded to remotest parts by those winged messengers of progress—the Horticultural Journals. Important, however, as the event was universally allowed to be: the flowering for the first time in Europe of the most extraordinary vegetable production which has hitherto come within the ken of science, no one could have dreamt, even in a daydream, far less could be have conjectured in an hour of sober thought, that that event would have risen to the great importance, as a fact of our nation's history, which it now holds. The appearance of that Lily blossom has, through the genius of Paxton—the prince of modern gardeners—been instrumental in raising in our land a structure of extraordinary character, whose influences on architecture will be world-wide. But it is not architecture alone that has benefited by the Lily blossom; nor is it that with which I have to do. If we turn over a few pages of horticultural history, we shall find that those peculiar tastes which have arisen among cultivators for particular tribes or families of plants, and which have, consequently, caused the extensive, and in some cases, almost exclusive cultivation of these, have in most, if not in all, instances, arisen from the discovery or introduction to our gardens of some member of the family whose superior qualities as an ornamental plant, have drawn considerable attention towards it. "Every dog has his day," to quote a vulgar phrase of most extensive application; but the taste for a certain family often remains long after the once admired beauty which gave rise to it has sunk into oblivion, eclipsed by a bright galaxy of her sisterhood, who have acquired under the gardener's care even a greater degree of loveliness than herself

It is therefore not to be wondered at that the introduction and successful cultivation in our country of so extraordinary and so beautiful a plant as the Royal Water Lily, "one of the most elegant objects in nature," should draw the attention of cultivators to the entire family of Water Lilies, and create a taste for their general cultivation, more especially when we consider that the different habits of the many lovely species which exist render them peculiarly suitable for universal culture, whenever a supply of water is to be had. While the Royal Water Lily requires accommodation, such as can alone be had in princely gardens, there are Water Lilies, of humbler growth indeed, but proportionally not less lovely, which can be conveniently grown in the ordinary stove or greenhouse; and even where no such conveniences exist for the growth of exotics, the hardy Naiads of our British lakes—scarcely less classical in modern song than the Lotus of Egypt is in ancient history—may be cultivated with little care or attention in the open air ponds, and in the streams and ditches that give birth to luxuriant and unprofitable growths of reeds and rushes.

That a very general taste for the cultivation of Water Lilies has been acquired in Britain since the flowering of the Victoria, has been sufficiently evinced by the frequent notices which have from time to time appeared on the subject. If I am to judge from these notices and other circumstances, there likewise exists at the present time a paucity of popular information concerning these plants, nearly coextensive with the general desire evinced to cultivate them. I, therefore, purpose to lay before the readers of The Gardeners' Magazine of Botany, from time to time, as leisure may occur, the history of some of those species of which I have not already given a full account in my work on Water Lilies.\* It will not be objectionable or out of place, if I occasionally step aside from the Water Lilies proper, and say a thing or two (as a Yankee would say) concerning the other families likely to prove agreeable and seemly companions to the Nymphæas in the Aquarium. Even a few observations may be offered on the

The Royal Water Lily of South America, and the Water Lilies of our land. Edinburgh: Hogo.

TON TO

Aquatics of our native lakes and rivers, streams and ditches; for I am under the impression that the time is not very far distant when the rich aquatic Flora of our land shall furnish the gardener, and especially the landscape gardener, with many valuable cultivated beauties as yet uncared for.

The lamentable death of Dr. M Fadyen, well known for his botanical researches, and author of the Flora of Jamaica has particularly called my attention at the present time to the Nelumbium jamaicense, D.C., the Water Bean of Jamaica, with which his name is inseparably associated, as it is almost entirely to his labours that we are indebted for a knowledge of this remarkable plant; and while lamenting the loss of so accomplished a botanist and so useful a man, some account of his researches in connection with

this plant may not be unacceptable.\*

Although the Water Bean of Jamaica was originally discovered by Dr. Patrick Browne in the island whence it derives its name, so long ago as the middle of the eighteenth century, it is only within the last few years that botanists have been able to add any new facts concerning the plant to those first recorded by its discoverer in his Civil and Natural History of Jamaica, published in London in 1789. His brief and imperfect description has therefore been generally quoted hitherto in systematic works. Although this remarkable plant is stated by Browne to have been pretty common in the lagoons, while he was residing in Jamaica, growing in "loose boggy ground, where the leaves may stand in open air. while the roots and lower part of the stems are plentifully supplied with moisture," yet it would appear to have decreased in frequency since; only on this supposition can we account for so conspicuous an object having so long eluded the keen eyes of the many excellent botanists who have subsequently engaged themselves in investigating the natural history of that productive island. It is now well known that the Nelumbium speciosum has entirely disappeared from the Nile, where it used to abound; and it would be interesting to ascertain the extent to which the Water Bean has decreased in Jamaica, if it has decreased at all. Aquatic plants are peculiarly liable to such changes, their frequency being in so great a measure dependent upon the nature of the country they inhabit. It would be easy to explain the partial disappearance of our native Water Lilies (were such to occur) on reference to the great extent to which draining has been carried of late years in rural improvement; but some other reason must be sought to account for the disappearance of the Nelumbium speciosum from the Nile, and N. jamaicense from the lagoons of Jamaica. Can it be that this family of colossal plants is slowly but gradually disappearing from the earth's Flora? In truth they remind one of those gigantic forms of animal life which geology has discovered to us in the stony records of the world's former history.

The Nelumbium jamaicense was unexpectedly rediscovered early in August 1847 (?) by James Dundas, Esq., a resident in the island, while engaged in carrying through some improvement connected with the drainage of land in the vicinity of a lagoon. This gentleman communicated specimens to Dr. M'Fadyen, who, being thus enabled fully to investigate the plant's history, gave an elaborate and interesting description, illustrated by coloured drawings from the pencil of his associate, Dr. G. M'Nab. To that memoir, containing all that is known respecting the plant, we have to express our obligations

in preparing the present notice of its history.

The submerged horizontal stem or rhizome is cylindrical, white, and one-third of an inch in diameter, each articulation sending up a leaf and flower stalk "as a pair," and producing from the origin of the petiole and flower-stalk numerous individual radicle fibres, attaining a length of from five to six inches, with black capillary fibrillæ, which penetrate into the black sedimentary mud in which the plant The rhizome is stated to exhibit, when divided transversely, "seven parallel tubular canals, encircling a smaller one in the centre, surrounded by cellular structure," the flower-stalk likewise displaying in a transverse section seven similar canals, and a smaller one in the centre, while the leafstalk exhibits only four such longitudinal tubes or canals connected by cellular structure. The leaves are orbicular and narrow, and measure about two feet in diameter when fully expanded. cylindrical angulose petiole, which is situate exactly in the centre of the leaf, soon clongates, eventually reaching to the length of from six to eight feet (one-third being under the water and blanched), while the leaf itself increases in size, and becomes depressed in the centre, assuming a figure which is aptly compared by M Fadyen to a Chinese hat reversed. The leaves are entire, smooth on the surface, of a "deep glaucescent green," paler beneath, furnished with numerous (about twenty-two) radiating nerves, which give origin to a series of secondary veins. The flower is yellow, and measures about nine inches across; it rises upon a stalk which, continuing to clongate during the maturation of the seeds, exceeds

<sup>&</sup>lt;sup>6</sup> Dr. M'Fadyen's death is thus aunounced by the Jamaica correspondent of *The Times*, + <sup>10</sup> Dr. M'F. dyen of kin iston, one of the most skilful and experienced practitioners, and one above all others who devoted his skill an (time in relaxing the distresses of the poor, has lately died. His wife and daughter were placed in such a situation as to be up the to attend upon ham, and I hear he died from neglect. Not a soul would relieve his sufferings or administer to his wants, save are follow practitioners, when they visited him. Of those for whom he did so much, not one returned to act the part of nurse. His death is a dark blot on the character of the negroes."

the length of the petiole when the fruit is ripe. The leaf and flower-stalks greatly resemble each other, the latter, however, being the thicker of the two; both are "dotted with minute black asperities, with the points reversed;" but these do not assume anything like the formidable aspect of the prickles with which the Victoria regia and Euryale ferox are armed. The flower is at first erect, inclining to one side as it becomes fully formed, the torus being quite drooping when the seeds are ripe.

The Nelumbium jamaicense has not, so far as we can learn, been applied to any economical use. The plant is, however, very singular and beautiful, and is of considerable interest even beyond the circle of scientific botanists. This plant has no great geographical range, being exclusively confined to the island of Jamaica, so far as hitherto known. Loudon in the *Hort. Brit.* notices a "Nelumbium jamaicense, D C.," introduced to the British gardens from Jamaica in 1824; but that must have been a different plant from the one now under consideration.

As it is exceedingly desirable to obtain information as to the success or failure of the numerous attempts which will be made all over the country to cultivate the various exotic and hardy species of Water Lily, as well as the Nelumbiums and other aquatic plants, allow me, in conclusion, to say, that I shall feel particularly obliged to any one who may kindly communicate the results of their trials, favourable or otherwise, either through the medium of the *Magazine*, or by letter, in all cases mentioning the system of culture pursued and the names of the species operated upon.

### HINTS ON SEED SOWING.

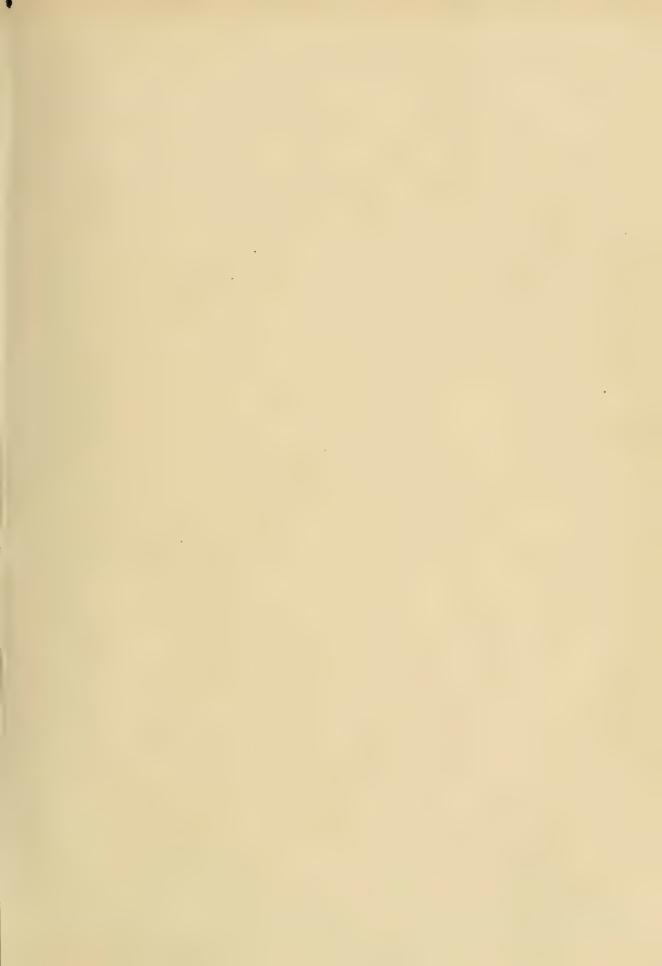
By Mr. M. SAUL, GARDENER TO LORD STOURTON, ALLERTON PARK, YORKSHIRE.

MS we have now reached the season for the sowing of seeds, I am induced to make a few remarks on the subject. They are principally intended for amateurs, in whose hands I have sometimes seen good sound seed, fail not only to produce a good crop, but to germinate.

Presuming the seed is good and perfect, there are still two points in connexion with seed-sowing, which are of paramount importance to the success and vigour of germination, and the regularity, strength, and luxuriance of the crop; these are, first, the proper mechanical condition of the soil; second, the regular and uniform depth at which the seed is deposited. The presence of air, moisture, and a certain degree of warmth is essential to the germination of seeds. In the absence of these agents the process of germination does not go on. The soil is the medium by means of which a supply of air, moisture, and warmth is kept up; but unless the soil be in a proper condition it cannot supply these; for if it be very dry, it will contain too much air and too little moisture to be favourable to germination. The proper condition of the soil for germination is, when it is neither very dry nor very wet: it is then moist but not wet; it has the appearance of having been watered, and is easily crumbled to pieces by the hand, without its particles adhering together. Now, whatever state the soil of a garden is in, it must be brought into this condition in order to induce success in germination, and strength and luxuriance in the after crop.

A state of too great dryness is of rare occurrence in this country; but the presence of too much water is not very uncommon; it is, however, easily remedied by drainage. The grand point is to get the soil thoroughly well pulverised. By draining and pulverising, the soil will be brought into a mechanical condition favourable for the germination of seeds. Temperature exercises a powerful influence over the time required for germination, and within certain limits, the higher the temperature is, the more rapidly does the process of germination go on. Now, the soil receives its heat through the medium of the air, consequently, the surface soil is more quickly heated than that deeper down. Whenever the air is warmer than the soil, the surface of the soil will be warmer than that below the surface; when, on the other hand, the air is cooler, the surface of the soil will by contact cool much more rapidly than that below the surface. From this, it follows that the most rapid germination will occur at about one inch or so below the surface, to which depth the heat will soon penetrate, and which, nevertheless, will not be so readily cooled during the night. On this account, seeds at this level will generally grow most rapidly, and the germination of others will occupy more and more time, as the distance between them and the surface is increased. It is owing to this fact that seeds too deeply sown do not grow at all, the temperature not being sufficiently elevated, and the supply of air being too limited to set the chemical processes at work which are essential to germination.

I think I have said sufficient to show that vigorous germination and healthy growth are dependent on the proper mechanical condition of the soil, and the regular and uniform depth at which the seed is deposited. So convinced am I of the importance of attending to these points, that I invariably sow all our seeds of every description, never allowing a labourer to sow even a pint of peas. The consequence is, I am very rarely disappointed.





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#### HEMIANDRA PUNGENS.

Nat. Order .- LABIATE.

GENERIC CHARACTER.—Hemiandra, R. Brown.—Calyx campanulate two-lipped, striate at the base, the lips flat, closed when in fruit; the upper erect, entire, mucronate, the lower half-bifid. Corolla with a short large tube, campanulate at the throat, the limb two-lipped, the upper lip bifid, the lower trifid, with the intermediate lobe emarginate-bifid; all flat. Stamens four, loosely ascending, the lower longer; filaments glabrous, anthers dimidiate, the fertile cell ascending, the barren cell slender, descending. Style almost equally bifid at the summit, the lobes awl-shaped; stigmas terminal. Achienia obovid and somewhat three-angled, coherent together and with the style.

reticulated at the apex.—Under shrubs or shrubs, natives of the S. W of New Holland; erect or decumbent; leaves lanceolate or linear, rigid, quite entire, pointed, one-five-nerved, peduncles axillary, one-flowered, solitary; floral and stem leaves pretty much alike.—(Endl. Gen. Pl. 3631).

Hemiandra pungens, R. Brown.—Prickly Hemiandra.—Glabrous, or with spreading hairs; leaves lanceolate or linear, spreading very much; peduncle much shorter than the calyx (?), upper lip of the calyx acuminate, prickly, inferior shorter inflexed, often recurved at the apex, throat of the corolla scarcely exserted.—(Benth. in De Cand. Prod. xii. 564).

erect and rigid, glabrous or hairy, bearing leaves which are from half an inch to an inch long, either linear or linear-lanceolate, striated, rigid and pungent at the tips, usually spreading horizontally or slightly reflected. Flowers axillary, on peduncles shorter or longer than the calyx, with two deciduous subulate bracts at the summit. Calyx glabrous or hairy, two-lipped, the upper lip longer, entire, terminating in a prickle; the lower lip shorter, bifid, the lobes acute. The tube of the corolla twice or three times as long as the calyx, inflated upwards; the limb two-lipped, the upper lip of two short obtuse lobes, the lower three-lobed, with two emarginate lateral lobes, and an intermediate much larger, deeply emarginate-bifid, toothed lobe; all spreading or slightly recurved; the colour pinkish lilac, with fine crimson spots on the paler part of the throat at the base of the middle lobe of the lower lip. Stamens didynamous, ascending, included; the anthers halved, with one ascending polleniferous lobe and a short slender spur-like descending process representing the other cell of the anther. Style filiform, bifid at the summit, the stigmas diverging.—A. H.

HISTORY, &c.—One figure of this pretty greenhouse shrub was made from a plant which bloomed in the collection of Mr. Henderson, of Wellington Road Nursery, St. John's Wood, during the past summer. It is an Australian bush, occurring frequently in the Swan River Colony, and also at King George's Sound. We learn that the plant had been recently obtained by Mr. Henderson from the garden of Baron Hugel of Vienna, whose name is intimately connected with Australian Botany.

CULTURE.—This pretty Swan River plant, to grow it successfully, requires to be potted in turfy peat and leaf-mould, with a little nice mellow loam, and sufficient sand potsherds and charcoal, broken small, to secure the porosity of the mass. In potting study the state of the plant; that is, if the plant is well rooted and healthy give a liberal shift, but if not, shift moderately until you induce free growth, after which larger shifts may be indulged in. For young growing plants no place is so suitable, from this time until July, as a pit where they can be kept syringed and tolerably moist, but with plenty of air at all times. Attend to stopping the rude growth as the plant requires it, and take care to get plenty of shoots from the bottom, or it will never form a good plant. The Hemiandras are propagated by cuttings of the half-ripened wood in silver sand, the pots being thoroughly drained. Keep the cuttings cool until they are callused, when they may be placed in a gentle bottom heat, and will speedily produce roots.—A.

## THEORY AND PRACTICE OF PRUNING.

By Mr. H. BAILEY, GARDENER TO G. V. HARCOURT, ESQ., M.P., NUNEHAM PARK.
THE FIG-TREE.

F all the fruits which we cultivate in Britain, the Fig-tree seems to be generally least understood. This is probably owing to the peculiarity of its mode of bearing, and the abortive luxuriance consequent upon the too free use of the knife, to which it is frequently subjected in order to bring it into regular shapes. No tree requires a smaller degree of pruning; and the old adage that "a pruned Fig-tree never bears" is literally a truism.

The Fig-tree is distinguished by this peculiarity, that in the course of one season it produces, upon

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two distinct sets of shoots, two crops of fruit. The Figs which appear when the first flow of sap takes place are those which alone ripen (upon a wall in this country) generally in September; those

which are produced afterwards do not come to maturity in our sunless climate. But under glass, assisted by artificial heat, they succeed perfectly. It must therefore be the object in managing the Fig-tree, as to pruning, to secure the greatest possible amount of moderately strong, short-jointed, and well-ripened wood, and to remove by degrees from the tree those shoots which have become old and naked. This must never be carried to an excess of severity, but must be a work of watchful and cautious progression. Root-pruning will always be found a useful auxiliary, and confining the roots within a limited space of soil is always beneficial.

It is customary to train the Fig in the fan shape; but this is not the form best suited to induce productiveness, unless modified by recurving the points of the branches. It is but too common to see Fig-trees mere aggregations of suckers; the branches emanating from the collar of the plant at the ground, and not being confined, as in other trees, to a single stem. The great objection to the fanshaped training for the Fig is, the excessive luxuriance which those shoots which approach nearest to a vertical position acquire; and the consequent unproductiveness of that most valuable part of the area upon which fruit-trees are trained, namely, the top of the wall.

We have observed that in the open air, in this country, only one crop of fruit ripens, while under glass we have the power of bringing to maturity the second crop, which always ripens in warmer latitudes. It is therefore obvious that, as the results to be aimed at are different, so must our treatment vary. For a crop of Figs upon the open wall, then, our object must be, as far as art is available, to increase the number of embryo Figs which are developed from last year's branches with the first flow of the sap. In order to effect this, the recommendation of Wickham is good, which we have confirmed in our own practice. It is, to "rub off, as soon as they can be discerned by the naked eye, all the Figs which are produced after Midsummer on the same year's shoots." These Figs Mr. Wickham calls (not inaptly) "sterilising incumbrances," and the effect of removing them is, that at the base of each fruit so removed another embryo is formed, which will produce a fruit that will ripen in the following autumn.

The figure represents a shoot of last year. The first figs were produced on wood of the previous year (which is not shown). The first growth, previous to Midsummer, extends up to A; at the joints B B B a second crop was formed, which was removed, and other embryos are now formed, b b b [not well represented]. From A to C is the second shoot, showing also Figs for the first crop of next season. Thus by this mode we succeed in getting a show of fruit which will come to perfection along the whole growth of last year, by merely removing that which in our climate no skill could have brought to maturity.

Mr. Knight found, that whenever a branch was extending with too much luxuriance, pressing it between the finger and thumb till its soft cellular substance was found to yield (not letting the nails come in contact with the bark) had the effect of repulsing the sap, and in consequence a fruit was formed and ripened at the base of each leaf. These Figs were formed upon our shoot (see figure), and with sufficient heat would have ripened, but they were taken off, as shown on the shoot at B B B. The reader will probably understand from this the application of the management under glass and externally.

It now remains to say a few words upon the training and formation of the tree. Horizontal training answers well for the Fig; and Mr. Knight has recommended training them with a tall single stem and radiating branches from the top of it, in a stellate form. We think this is open to the same objection as fan-training—namely, the superior vigour of the most vertical branches, as compared with the depressed ones. We also venture to opine, that training up a single tall stem with two horizontal branches at the top, and then training

down perpendicularly would be preferable, as calculated to balance the tree better. It is quite true



that we seldom see Figs trained otherwise than in the fan mode, and that such trees, when the points of the branches are recurved, and they are otherwise well managed, frequently produce fine crops; but such are exceptions to the general rule. In forming a horizontally-trained tree, it must be headed down within eighteen inches of the ground to three buds, two of which must be trained horizontally right and left, and the centre upright, to be again headed back to form future tiers of branches. Thus it will appear that the use of the knife in managing the Fig-tree should be very occasional; the cuts may be "few and far between." A vigilant eye, and the finger and thumb, may do nearly all the pruning requisite.

Fig-trees in pots may be thus managed without any use of the knife; frequent stopping, pendulous training, and a rich soil, will do all they can be desired to do, with root-pruning, which is of much consequence to their success. Late in the autumn, they may annually be turned out of their pots and the roots pared (to the thickness of an inch) all round with a sharp knife, and then re-potted in strong rich soil. This plan was long practised at the late Lord Harewood's seat in Yorkshire, with most successful results.

Standard Figs are now seldom met with, unless in some very favoured locality. The finest fruit we have seen lately was during the past autumn on some trees at Osborne House, the seat of her Majesty. They only require a dry bottom and a genial climate. In such places the pruner may consider his "occupation gone," unless the branches (very occasionally) become too crowded.

## OBSERVATIONS ON THE ASPECTS OF FRUIT WALLS.

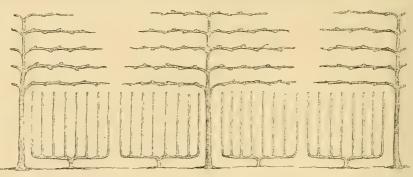
BY MR. JOHN COX, GARDENER TO WILLIAM WELLS, ESQ., REDLEAF.

MHE most eligible aspects for garden fruit-tree walls is a subject which, I think, may be with some advantage made the basis of a few useful considerations, which, although probably most applicable to the future, may yet on some points call up fresh ideas at the present time. It has long been my opinion—and as further experience has made me more acquainted with the quantity and continued supply required by most families of taste in the present day I am confirmed in that opinion that, for the general purposes of early and late supply, the walls ought to consist almost wholly of north and south aspects. On one or the other of these may be brought to perfection every hardy fruit cultivated in this country; and what is of more consequence, the season of most of them may be greatly extended. Indeed, in cases where families are not accustomed to retire to their country-seats until the breaking up of Parliament, or the approach of the shooting season, it is quite indispensable to have a good stretch of north walls, in order to be able to retard the ripening of some of the kinds; and it will effect this to a greater extent than many would suppose. I have observed that the difference in the time of ripening the same kinds on south and north aspects is often as much as three weeks; and the length of time which fruit will hang on, and keep fresh and plump, is greatly in favour of the latter. To enter more into practical detail, let us take Cherries as an example, and I have no hesitation in stating that every kind of Cherry may be brought to great perfection on a north wall. They will erop there with more certainty, because the expansion of the bloom is retarded, and ripen as well, with as good a flavour as ever came from the sunny south; and therefore, bearing in mind the utility of a late supply, I would only plant—say three, or at most four trees, on a south aspect, and all the rest on the north. I should thus have a certainty of prolonging the general season of these fruits greatly beyond the usual season. Again, the advantage of a north aspect for red and white currants is well known; but it may not be so generally known that the old Warrington Gooseberry may be had in perfection from a north wall long after those in the open quarters are all gone. And this leads me to a still more practical illustration. I would recommend the adoption of the following plan for furnishing some portion of the north walls:—Plant Cherries with a clear stem of at least six feet, at the distance of sixteen feet apart; these are to fill the top part of a wall fourteen feet high (and no garden-walls should ever be less). Next, at a distance of four feet from each Cherry (and on each side of it), plant Gooseberry or Currant trees. The Cherries should be trained in the horizontal manner, under which system they will flourish and crop as well as any other, and it affords the readiest means of quite filling the wall. The first year after planting, the Gooseberries should be devoted to obtaining shoots diverging each way horizontally along the bottom, at one foot from the ground; afterwards, train up from these a number of branches perpendicularly, at six or eight inches apart -a reference to the accompanying figure will show my meaning better than I can describe it. The Gooseberries will be found to fill their allotted space sooner than the Currants, because the latter will require closer pruning and heading back to get a good stock of fruit-spurs. The breastwood should be kept well shortened in the summer, as leaving it on until the winter pruning would soon ruin the trees. As the wood gets old

and unfruitful, cut it out and train up young wood. Let me observe that this is not a new plan. From a wall so arranged my father and I, twenty years ago, gathered Morello Cherries and Red and White Currants, on the 25th December. I mention this to show what may be done under favourable circumstances; but of course it is longer than such fruits need be kept, because it is done at the sacrifice of flavour.

But to return to the subject of aspects: Who that knows the wants of a large establishment can have too much south wall or south borders for early crops? or north wall and north borders for summer crops? And let me add, that the other two aspects are of little comparative advantage with regard to the summer

the summer consumption, because they fill up no gap in the season which will not be filled to greater advantage by those which I recommend to predominate. Their proper tenants, there-



fore, will be Pears, which being principally autumn and winter fruits, do not affect the general consumption, and these aspects suit them well.

These considerations would seem to point to the great advantage to be derived from laying out our kitchen-gardens in parallelograms rather than square shapes, so that, if a given space is to be enclosed, it will be better to have it in two or three long compartments running from east to west, so as to give nearly all north and south walls. I think I could show how the spaces between these walls would be easier worked, and to much greater profit, than large open squares; but that ought to have a plan to elucidate it, and deserves more consideration than I can now bestow upon it.

I have said that the flavour of fruit from a north aspect is equal to that from the south; and, as many will be disposed to doubt this, I will just state why I think so; not, however, that I can here enter into the merits and demerits of all that bears upon the subject, for it is one that will bear an extensive examination, and involves more than would at first glance strike a casual observer or thinker. The influence of direct sunlight is held to be of paramount importance to the perfect maturation of both fruit and wood; and in the case of the tenderer kinds, as Peaches and Vines, it is undoubtedly so. But it is not so to the hardier sorts; nor would it be to the others, if we had higher and more equal temperature in spring and autumn. To me, the perfect maturation of wood appears to depend more on a fine warm autumn than ever so hot a summer; and on a long-continued equal temperature, rather than a great amount of direct sun-heat.

The temperature of a north aspect is, on the year's average, far more equal than any other, and less liable to the extremes of heat and cold; this then is one reason why fruit-trees may be supposed to crop and flourish well in the absence of the direct rays of the sun—and as for the flavour, provided the trees are not over-cropped, it is quite as good without the sun as with, nay, it is sometimes preferable; for I have often seen Apricots and Green Gage Plums on south aspects quite ripe on the side exposed to the sun, and green and hard on the opposite side, whereas, at the same time, I have found many fruits covered with leaves, and on which the sun's rays have never shone direct, perfectly and equally ripe—with a rather paler colour, it is true, but flavour quite equal to the tit-bits of the sunny ones. Does not even this show that direct sunlight is not absolutely necessary to ripening and flavour? In the case of Cherries, from the May Duke to the most exquisite-flavoured Biggareau, the flavour is perfectly on an equality with any other aspect, if they are allowed to hang long enough on the trees.

## THE FORMS OF ANCIENT VEGETATION.\*

JF, after having studied fossil plants in regard to their organization, we compare the different forms which have inhabited the surface of the earth at different epochs of its formation, we shall perceive that great differences present themselves in the nature of the vegetables which have been successively

\* Brongniart in Annales des Sciences Naturelles: Botanique. An abstract of a translation by Mr. Henfrey in the Annals and Magazine of Natural History.

developed—not merely specific differences, more frequently profound differences, so that new genera or families take the place of genera and families destroyed and completely extinct. A more general and important result also presents itself, namely, the predominance in the most ancient times of acrogenous cryptogamic plants (Ferns and Lycopods); later, the predominance of gymnospermous dicotyledons (Cycads and Conifers) without the admixture yet of a single angiospermous dicotyledon; finally, during the cretaceous formation, the appearance and soon the predominance of angiospermous plants, both dicotyledons and monocotyledons. We may divide the long series of ages which have presided over this successive birth of the different forms of the Vegetable Kingdom, into three long periods—1, the reign of the Aerogens; 2, that of the Gymnosperms, and 3, that of the Angiosperms.

I. The great predominance of the acrogenous division, and in particular of the families of Ferns and Lycopodiaceæ, the considerable number of species of the first of these families, the great development of the plants of the second, and the arborescent form of the Lepidodendron, form the most striking characters of this reign, which comprises the Carboniferous and Permian periods. The long carboniferous period begins with the appearance of the first terrestrial vegetables deposited in certain layers of the transition formations, and extends to the new red sandstone which covers the coal formation. The characters of the vegetation may be summed up thus:—The complete absence of angiospermous dicotyledons; the complete absence (or nearly so) of monocotyledons; the predominance of acrogenous cryptogams, and forms unusual and now destroyed in the families of Ferns, several arborescent Lycopods forming gigantic trees, and Equisetums almost arborescent; the great development of gymnospermous dicotyledons of families completely destroyed from the close of that period consider that this vegetation, thus nearly reduced to forms which we consider the most simple and least perfect, owed that special nature to its being a first phase of the development of the organization of the vegetable kingdom, which had not yet attained to the perfection it subsequently arrived at; or was it due to an influence of the physical conditions in which the surface of the earth was then placed? We are not sufficiently acquainted with the influence of the nature of the atmosphere upon the life of vegetables, when prolonged through their entire existence, to know whether important differences in the composition of that atmosphere, and, above all, the (very probable) presence of a greater proportion of carbonic acid might not favour the existence of certain classes of the vegetable kingdom, and oppose that of other groups. The nature of the plants which appear peculiar to the Permian period is far from being positively determined.

II. During the preceding period, the acrogenous cryptogams predominate, and the gymnospermous dicotyledons, less numerous, present themselves in forms unusual and sometimes anomalous. Subsequently these anomalous and ambiguous forms disappear. The Ferns and Equisctaceæ are less numerous. The Conifera and Cycadacea almost equal them in number, and ordinarily surpass them in frequency; and by their abundance and dimensions become characteristic. Angiospermous dicotyledons are still wholly wanting, and monocotyledons are very few in number. This second kingdom is divisible into two periods. 1. The Vosgesian period, which does not appear to have had long duration, presents the following characters: -the existence of a tolerable number of Ferns of forms frequently anomalous, manifestly constituting genera now destroyed; the stems of arborescent Ferns more frequent than in the next period; true Equiseta very rare; Calamites, or perhaps rather the Calamodendra, abundant; gymnosperms represented by two Coniferous genera, the species and specimens of which are numerous, while Cycadaccæ are very rare. 2. The Jurassic period, one of the most extensive in regard to the formations it comprises, and the variety of special epochs of vegetation embraced in it, comprising from the Keuper inclusively to the Wealden formations. In this period the Cycadacere become predominant by the number of species, their frequency, and the variety of the generic forms. The flora of the Keupric epoch resembles that of the lias in the Ferns, and some forms of Cycads. The Liassic epoch is distinguished by the great predominance of Cycadaceae, and the existence among the Ferns of many genera with reticulated nervation. The Oolitic epoch, comprehending from the lias up to the Wealden formation exclusively, is characterized by the rarity of the Ferns with reticulated nervation, numerous in the lias, and the frequency of genera of the Cycadaceae most analogous to those now existing. In the Wealden epoch the generic forms are almost all the same as those of the lias and oolitic formations; nevertheless, the Cycadaceae already appear less numerous in proportion to the Ferns. This fresh-water formation, which terminates for us the kingdom of the Gymnosperms, is allied by its total character to other epochs of the vegetation of the Jurassic period; and is distinguished from the cretaceous epoch, which succeeds it, by the complete absence of every species which can be referred to the angiospermous dicotyledous.

III. The predominant character of this transformation of the vegetation of the globe is the appearance of the angiospermous dicotyledons; of those plants which at the present time constitute more than

three-quarters of the vegetable creation of our epoch, and which appear to date their predominance from the origin of the tertiary formations. The plants even extend back to the commencement of the cretaceous period. Thus we may distinguish in the reign of Angiosperms two great periods, the cretaceous and the tertiary. 1. The Cretaceous formation, taken as a whole, appears to constitute a first period of the reign of the Angiosperms, forming the transition between the vegetation of the secondary formations and that of the tertiaries,—presenting, like the former, still a few Cycadaceæ; like the latter already a few angiospermous dicotyledons. This period is, moreover, characterised by several Coniferæ peculiar to it: in the marine subcretaceous lignites of the Isle of Aix, by marine plants and Coniferæ; in the green sand of the South of England, by Cycadeæ, Coniferæ, or marine plants only; in the ferruginous sands of France, by an arborescent Fern; in the fucoid sands solely by marine plants. These fucoid sands, which form a very distinct epoch, appear up to the present time characterised solely by marine vegetation, and in a botanical point of view constitute the line of demarcation between the cretaceous and the tertiary formations. 2. The collective nature of the plants of the Tertiary period, contemporaneous with all the tertiary deposits, and surviving even yet in the vegetation clothing the present surface of the earth, is one of the most characteristic. The abundance of angiospermous dicotyledons; of monocotyledons of various families, but especially of palms, during at least a portion of this period, distinguishes it at once from the more ancient. In the cretaceous period, the angiosperms appeared almost to equal the gymnosperms; in the tertiary they much exceed them. The division of this period into three principal epochs—eocene, miocene, and pliocene, is sufficient for the comparison of the successive changes of the vegetable kingdom. The most remarkable characters drawn from the vegetable forms during these epochs appear to be-1, or Eocene; the presence but rarity of Palms, confined to a small number of species; the predominance of Algæ and marine monocotyledons, attributable to the great extent of marine formations during this epoch. 2, or Miocene; the abundance of palms in the majority of localities; the existence of a tolerably large number of non-European ferns; and particularly of the genus Steinhauera, supposed to be a rubiaceous plant. 3, or Pliocene; the great predominance and the variety of dicotyledons, the rarity of monocotyledons, and especially the absence of palms; lastly, the general analogy of the forms of these plants with those of the temperate regions of Europe, North America, and Japan.

Finally, to conclude our observations on this flora of the last geological period, preceding the existing one, we will direct attention to the fact, that, in spite of the general analogies which exist, between the plants of these formations and those which at present live in the temperate regions, not one species appears to be identical at least with any plant now growing in Europe; and if in some rare cases identities appear to exist, it is between these fossil plants and American species. Thus the flora of Europe, even in the most recent geological epoch, was very different from the existing European flora.

#### TEXTS AND COMMENTS.

LANT GROWING.—"Can a collection of the finer kinds of greenhouse plants be grown to perfection without some of them requiring, at certain times, more than ordinary greenhouse temperature?" This question is frequently asked, but has never, to our knowledge, been properly answered. In reply we would remark, that the plants associated together in our greenhouses come from very varied localities, some from countries where frost is not known, and others from places where they are exposed to a lower temperature than is considered proper for them in this country. Hence, for example, though the heaths from the Cape may not be injured by a few degrees of frost, it is quite certain that the Kalosanths, or Crassulas, as they are more commonly called, would suffer irreparable injury. Some plants from New South Wales and New Holland are nearly hardy, but others are remarkably tender, and require here something more than greenhouse temperature. Those persons who are the most successful exhibitors, grow many of what are considered greenhouse plants in considerable heat, and almost all the finer kinds of New Holland plants, require in the growing season a temperature above, rather than below, fifty degrees. It has frequently been explained in this Magazine that such plants as Crowea saligna, and elliptica, Eriostemons, Boronias; Chorozemas -Henchmanni, triangularis, and spectabile; Gompholobiums-more especially splendens, versicolor, and polymorphum splendens; Podolobiums - staurophyllum, and triangulare, Pimeleas - more especially rosea, and Hendersonii; Aphelexes, Dillwynias, Burtonias, Polygalas, Leschenaultias, Acrophyllums-all these plants in their native habitats are exposed not only to warmer, but to longer summers than they are subject to in this country; and hence, to grow them successfully, they must have more heat than they get in ordinary greenhouses. Indian Azaleas live and grow in a low temperature, and are not materially injured by a few degrees of frost, but they delight in a brisk

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moist heat in their growing season, and it is indispensible to their proper management. Pelargoniums, again, Calceolarias, and many more soft-wooded plants will grow in a low temperature, but the large specimens produced by Mr. Cock and Mr. Parker will rarely have less than fifty degrees of heat from February until they are in bloom. Fancy Pelargoniums require more heat to grow them properly than the show kinds; a low temperature with much moisture is certain death to them; and we recollect the time when the Cape species were grown as stove plants. The mistake, however, which persons not versed in plant management fall into, is that of not discriminating between a little additional heat and too much; and hence the great importance of an intermediate house; a sort of cool stove and warm greenhouse; a place where a vast number of occupants of both places, as well as many Orchids, grow to perfection. A house, however, where greenhouse plants are grown, must not be a close house, the temperature must be kept up to the required heat, but at the same time it must be freely ventilated day and night, at least in favourable weather. From February until July young growing specimens of the plants we have enumerated, and many more, require such treatment, and they will make double the progress they could do under the cool system; and that if they are properly ventilated without making long-jointed wood; in fact, the growth will be short, strong, and healthy, but if you give too much heat, shade, or atmospheric moisture, your object will be defeated .-- A.

Asparagus Culture.—"A fair crop of heads must be left after four or five weeks' cutting, but not one head must be allowed to grow until you leave off cutting at the end of the [season] fourth year." -- Card. Chron., p. 84.-This is one of those blunders which we frequently see handed down by unreasoning people from generation to generation, and is the prolific source of the blanks we frequently see in Asparagus beds, not only in market gardens, but also in those of private gentlemen, for whether the plants be weak or strong, it matters not, cut every stem must be, until the arbitrary rules of blind practice are satisfied; and the consequence is, the weak plants are so completely exhausted as not to have the power to produce another shoot, and hence a blank occurs in the bed. We all know, at least every gardener ought to know, that the largest tree in creation could be destroyed by a constant removal of the young foliage as fast as it was produced. It is the best system to eradicate deep-rooting weeds of all kinds; even Horseradish, Bindweed, Couch, and Thistles must yield to the constant destruction of their foliage; and yet, to a certain extent, we pursue precisely the same system with one of our most delicate and useful vegetables. We know an instance where a gardener, who was acting under the directions of his employer—a reader of the journal quoted above—completely destroyed his Asparagus beds, by following the directions too implicitly; for he cut every shoot throughout the season. The right way to pursue is, to cut every shoot for the first fortnight or three weeks; then when the supply is plentiful, leave one or two of the strongest shoots to each plant, and continue cutting so long as the grass is fit for use, for after a month or five weeks' cutting, the grass becomes stringy, a proof that it is time to leave off. After this destroy the very weak shoots, but leave sufficient strong ones thinly over the beds, and attached to each plant, to replace and store up for the succeeding season sufficient matter for the healthy action of the plants. It is not advisable, however, to crowd the plants; a few strong shoots to each plant, properly exposed to light and air, will be superior to a multiplicity of small ones; and the small shoots, if they have not sufficient room, will be better removed than left to deprive the others of light and air. What with chopping the roots off every season, and exposing the perpendicular sides of the beds to the drying influence of the sun and air, and cutting every shoot until the plants cease to produce shoots fit for market, the Asparagus has but a poor time of it in our market gardens, and must be classed among the most ill-used plants; but a better system of planting is gaining ground, and though the grass may not be quite so early as where it is forced by the sun's rays impinging upon the perpendicular sides of the beds, it is quite certain it will be much superior in quality, and yield a larger supply. No doubt the drumstick quality of the London Asparagus, and its want of flavour, is attributable as much to the want of moisture, consequent upon the deep-bed system as to its being so much blanched; indeed, we have cut Asparagus in the Fens of Cambridgeshire perfectly white or blanched, and yet catable and well flavoured for a length of six or seven inches.—A.

#### SUGGESTIONS ON ELECTRICITY.

By Mr. J. TOWERS, Corresponding Member of the Royal Agricultural and Horticultural Societies.

M T p. 86 (vol. i.), are these words:—"I do not include Electricity: since, although it must be supposed to exercise a very important agency over vegetation, we are at present wholly without satisfactory data as to the occurrence of electrical phenomena in plants." The following observations and queries have been elicited by this passage.

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The existence of that etherial element which, for want of a better name, is called *Electricity*, and its presence in the atmosphere, are facts that few would be so hardy as to dispute: the periodicity also of its variations are perhaps equally established by well attested instrumental observations. Above twenty-three years ago, while in search of evidence in proof of the vital agency of Electricity, I met with a letter signed "T. P.," on the Relation between Electricity and Vegetation, from which I borrow a few paragraphs—put, however, in the form of questions—in order to induce reflection:—Thus, assuming that vegetation extracts the etherial fluid from the atmosphere—Are not living plants and their juices peculiarly adapted to imbibe the effluvium; and, is it not highly probable that they are indebted to its influence for their vitality? Vegetables abound in pointed terminations communicating with juices passing through capillary tubes—Do not the leaves of trees, and even their fine ramifications, terminate in buds? Will not a few blades of grass, held towards the knob of a charged jar, the circuit being completed by the human body, silently, but quickly discharge that jar without sensibly affecting the human frame? Even a thorn or a thistle-will they not vie with, or excel, the sharpest needle in this discharging power, for, it may be observed, that they are far better fitted to act upon the electricity of the atmosphere, as the deposition of moisture (dew) consequent to the withdrawing of the effluvium which holds it in a state of vapour, so far from diminishing their power of conduction, as in the case of metals, is the very principle of their nutrition?

The repugnance with which the atmospheric electrical agency is met by some persons of high intellectual attainments is remarkable; they are ready enough to talk of caloric—of heat, radiating and reflecting—of light, in the abstract, and of electricity as visibly developed by machines or the voltaic apparatus; but they are contented to pass over the silent operations of that etherial element which pervades all nature—which is, and has been, excited by a breath of air, however inappreciable its force, and by the falling of a feather through that air, when even in the calmest state of repose.

Since the year 1830, much light has been thrown upon electrical science by the publication of Professor Faraday's Elemental Researches. In the seventh series of that work (Anno 1834), many experiments are described which tend to establish the identity of chemical and electrical action; but it is to the sections No. 860-2, on the quantity of electric force in matter, that we look for a positive and indisputable proof of the energy which is universally distributed throughout every particle of matter, organic or inorganic! At No. 861, it is stated that the decomposition of a single grain of water required the passage of a quantity of electricity equivalent to 800,000 charges of a Leyden battery; and, "considering that for a definite quantity of electricity passed, an equally definite and constant quantity of water, or other matter, is decomposed; considering also that the agent, Electricity, is simply employed in overcoming electrical powers in the body subjected to its action, it seems probable, and almost a natural consequence, that the quantity which passes is the equivalent of, and therefore equal to, that of the particles separated; i.e., that if the electrical power which holds the elements of a grain of water in combination, or which makes a grain of oxygen and hydrogen in the right proportion unite into water when they are made to combine, could be thrown into the condition of a current, it would exactly equal the current required for the separation of that grain of water into its elements again."

Here a question of great moment presents itself: To what source are we to trace the Electricity which decomposes water into its rudimental elements, or separates its particles and brings them into that minute state of division wherein they exist as vapour or steam? When an electric current is produced by the voltaic (galvanic) battery, it must be referred to the decomposition of water itself within the metallic cells, excited by the direct chemical action of the acids employed upon the zinc of the plates. Now, if chemical energy gives the first exciting spark, it is reasonable to infer that the reciprocating phenomena which follow in uninterrupted succession, must be electro-chemical. And again, if the *volume* of electricity thus developed in the cells, be obtained from a quantity of water so small as scarcely to be appreciated, that particle *must* have originally contained the quantity of electricity, be it more or less, which it yielded as a current.

Steam and vapour (whether produced by sensible heat, or naturally as they exist in haze and fog), consist of watery particles in a state of minute division, and kept asunder by electric repulsion. If these facts be admitted, then it will follow that water is one of the chief electrifying agents of nature.

Those who oppose the theory appear to have founded their objections on experiments made upon plants by excited electric currents. When a tree is struck by lightning, it receives injury to a greater or less extent; but the mild inductive agency of the element, diffused throughout the atmosphere, is of a character widely different from that which it assumes when condensed within the volume of a thunder cloud.





Royal Dorale

## ROGIERA CORDATA.

Nat. Order.—Cinchonace.E.

GENERIC CHARACTER .- Rogiera, Planchon .- Calyx with the tube globose, adherent to the ovary; limb four-parted, the segments short or rather long. Corolla salver-shaped, limb with obtuse segments, quincuncially imbricated in æstivation, the throat bearded, destitute of a prominent ring. Stamens five, inserted above or about the middle of the tube of the corolla; filaments bristle-like, longer than the anthers; anthers linearoblong, affixed by the back in the middle of the very narrow connective, connivent on the throat of the corolla, or flat and included; anther-cells two, parallel, bursting by a vertical slit. Disk epigynous, annular, nectariferous Style filiform, bifid at the apex, the compressed linear divisions slightly dilated, with papillose stigmatic surfaces within. Ovary two-celled; placenta axile, undivided, bearing ovules on the entire surface. numerous. Fruit a sub-globose capsule, bursting loculicidally with entire valves. -Shrubs from Guatimala; branches dividing ternately or in forks; leaves opposite, oblong, feather-veined; stipules rather large and entire, each formed of two confluent adjacent ones; cymes terminal, sessile, three-forked, many-

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flowered; flowers crowded, of a pretty rose-colour, bearded with golden hairs in the throat; bracts on the secondary and mostly on the tertiary branches, innate on the peduncles above the base, trifid. All parts, even the outside of the corollas, pubescent with long loose hairs; the hairs of the throat and inside of the corolla articulated.

ROGIERA CORDATA, Planchon. — Heart-leaved Rogiera. — Leaves subsessile, ovate or ovate-lanceolate, acuminate, cordate at the base, coriaceous, with scattered hairs above, and on the veins beneath, or at length becoming glabrous; stipules ovate-lanceolate, foliaceous, reflexed; cymes terminal, corymbose, many-flowered; teeth of the calyx half the length of the tube, triangular; filaments inserted above the middle of the tube of the corolla; anthers reaching to the throat; the style about half the length of the tube.

Syn.—Rogiera cordata, Planchon: Flore des Serres, sub t. 442; Rondeletia cordata, Bentham: Plantæ Hartwegianæ, p. 85; R. thyrsiflora of gardens.

ESCRIPTION.—A showy shrub said to grow four to eight feet high, with three-forked or twoforked branches, and somewhat leathery opposite leaves, ovate-lanceolate in form, acuminated
at the summit and slightly cut into a heart shape at the base, three to four inches long, with
scattered hairs above and on the veins beneath, mostly disappearing with age. The stipules,
which are composed of two blended together, form single, entire, ovate-lanceolate, leafy bodies
half an inch long and curved downwards. The large cymes of numerous rose-coloured flowers
are terminal and corymbose. The salver-shaped corollas are hairy on the outside and have a
dense fringe of gold-coloured hairs in the throat; they are much longer than the minute, shorttoothed calyx. The filaments rise above the middle of the tube, and the anthers reach to about
the base of the incisions between the lobes of the corolla; the style terminates in two flattened
linear stigmatic lobes about half-way up the tube of the corolla.

In the description of this plant in the *Plantæ Hartwegianæ*, the flowers are said to be tetramerous, but this, as pointed out by M. Planchon, is an error, as we also have ascertained by the examination of original specimens in the collection of the British Museum. The various species of this genus are said to last long in flower, and have a sweet but not very fragrant odour; the profusion of the blossom and the delicacy of the colour make up for the small size and inconspicuous character of the single flowers.—A. H.

HISTORY, &c.—The pretty stove shrub represented in the accompanying plate, was, we believe, first raised in this country some three or four years since by Mr. Smith, gardener to J. Anderson, Esq., of the Holme, Regent's Park; the plant being an accidental seedling which germinated in the soil adhering to some imported Orchids. About the same time Mr. Basset, gardener to R. S. Holford, Esq., raised the same or an allied species in a similarly accidental We have not had an opportunity of closely examining the flowers of these plants, but from the identity of foliage between our present subject and Mr. Smith's plant, we have no hesitation in regarding them as being of one species. It however reached this country last year from another source, namely, the nursery of M. Van Houtte of Ghent, where four or five species of this new genus Rogiera have been recently flowered. They are all natives of the temperate regions of Guatimala, often growing in company with Lycaste Skinneri. In the hands of clever cultivators we have no doubt the kind now represented will form a very ornamental plant, being managable and conspicuous from the masses in which its tender rose-coloured flowers are produced; but, as it is a free-growing plant, it will require attention to keep it within the bounds which fashion has prescribed to examples of first-rate culture. Our figure was made in February from a dwarf plant, very nicely flowered by Mr. Gaines, nurseryman, of Battersea.

Rogiera amona (see vol. ii.) with which the present subject has been identified in *Parton's Flower Garden* under the name of Rondeletia thyrsoides, is a different and apparently a coarser growing species, flowering however very freely in a young state. R. Roozlii has more of the habit of R. cordata. Both these are also in cultivation in this country.—M.

CULTURE.—Among the many useful plants recently introduced, this is certainly one of the most valuable, having, among other charms, delicious fragrance to enhance its value, being scarcely less sweet than the Gardenia, or Cape Jasmine. Like the Rondeletias, the Rogieras require a stove temperature, and considerable bottom heat, to grow them to perfection. receiving a young plant of this species from the nursery, if it is strong and well-rooted, pot it immediately, using a compost consisting of turfy peat and leaf-mould, to which a little nice turfy loam may be added, with sufficient sand charcoal and potsherds broken small, to keep the whole free and open. Pot rather lightly, and not too liberally until the plants are strong; and to promote a robust growth, and induce plenty of roots, do not stop the plants more than is indispensible to their proper formation, until they attain considerable size. For young plants, during the growing season, a dung frame or pit is the most suitable place, as almost all stove plants delight in the atmosphere of fermenting materials, more especially if those materials are impregnated with ammonia. In such an atmosphere young stove plants will make more progress in a few weeks, than they would in months in an ordinary stove. Pot the plants as they progress in growth, and an occasional watering with weak manure water will be found very beneficial, especially when the pots are full of roots.—A.

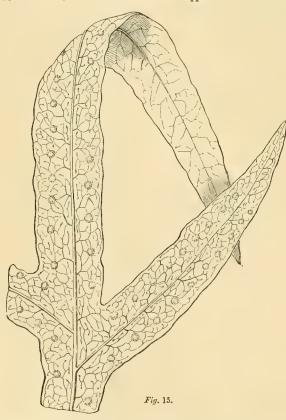
## THE GENERA AND SPECIES OF CULTIVATED FERNS.

By Mr. J. HOULSTON, ROYAL BOTANIC GARDEN, KEW; AND Mr. T. MOORE, F.L.S., &c. Sub-order—Polypodiace: Tribe—Polypodieæ. Sect. II. (Continued).

RYNARIA, Bory. (Polypodii, sp. of Authors). Name said to be derived from Dryades, the goddesses of woods and trees, in allusion to the sublime appearance of some of the species, and their native habitation; but

more probably from *dryinos*, oaken, the name having been originally applied to the oak-leaved species, D. quercifolia.

Sori round or oblong, naked or squamiferous, produced on the angles or points of confluence of numerous venules (compital), superficial, or deeply immersed, forming elevated protuberances on the upper surface of the frond; transversely uniserial, or arranged in one or two oblique rows between each two of the primary veins, or irregular. Veins pinnate, parallel, or flexuose; venules compoundly anastomosing, producing from their sides, variously directed, free sterile veinlets, with apices generally rounded or club-shaped. Fronds from a few inches to four or five feet long, simple pinnatifid or pinnate, membranous or coriaceous, glabrous or pilose. Rhizome creeping.—The species belonging to this genus have an aspect as varied as their geographical distribution; some are very membranous, others are remarkably rigid in texture, almost without parallel amongst Ferns. Many of the more beautiful forms are at present unknown in cultivation. They all have creeping rhizomes, and are well adapted for cultivating on logs of wood, trunks of trees, or amongst light, open materials, where they form very beautiful and highly ornamental objects. Their compound anastomosing venation is common to many other genera, even in the same section; but the primary characters that distinguish the Drynarias from all asso-



ciates are:—the naked or squamiferous compital sori, and the compound or zigzag anastomose branching of the veins, with sterile veinlets in the arcoles. Fig. 15 represents a portion of *D. Billardieri* (nat. size).

§ PHYLLITIDIS, J. Smith.

1. D. hemionitidea, J. Smith: Wallich (P. membranaceum, Don.)—A very delicate evergreen stove species, from the East Indies. Fronds glabrous, simple, one to two feet long, broadly lanceolate, light green, undulated, very membranous, attenuated at the base. Sori round, small and irregular. Fronds lateral, articulated on a scaly, creeping rhizome.

2. D. irioides, J. Smith: R. Brown.—A glabrous, evergreen, ornamental stove Fern, native of the Mauritius, East Indies, and New Holland. Fronds simple, two to three and a half feet long, light green, fleshy, oblonglanceolate, ensiform, attenuated at the base, and often irregularly lobed at the margin. Sori very small (hence called Microsorum irregulare by Link), numerous, thickly scattered on the upper half of the frond. Venation internal. Fronds lateral, articulated on a scaly, creeping rhizome.

3. D. crassifolia, J. Smith.—A coarse-growing, glabrous, evergreen, stove species, from Brazil, Peru, and the West Indies. Fronds simple, oblong-lanceolate, attenuated at the base, two to three feet long, and three or four inches wide, coriaccous, dull green. Sori large, round, or oval, uniserial between each two of the primary veins, Fronds lateral, articulated on a scaly, creeping rhizome.

PHYMATODES, J. Smith.

4. D. pustulata, J. Smith (P. cæspitosum, Link).—A dwarf, glabrous, evergreen, greenhouse Fern, from New Zealand. Fronds from a few inches to a foot long, simple or pinnatifid, with lanceolate-acuminate membranous pale green segments. Sori round, uniserial, and submarginal. Fronds lateral, articulated on a cæspitose, creeping rhizome.

5. D. Billardieri, J. Smith: R. Brown (P. scandens, Labillardiere).—A creeping, evergreen, greenhouse Fern, native of New Holland, New Zealand, and Van Dieman's Land. Fronds glabrous, erect, about a foot high, simple or pinnatifid, with a few linear acuminate segments, coriaceous, deep green, attenuated at the base. Sori large, round, uniserial, immersed. Fronds lateral, articulated on a cæspitose, creeping, scaly rhizome.

6. D. vulgaris, J. Smith (P. phymatodes, Linnæus).—A beautiful evergreen, glabrous, stove species, native of the Mauritius, New Holland, East Indian and Malay Islands. Fronds articulated on a black, scaly, creeping rhizome, rather erect, triangularly ovate, pinnatifid, one to one and a half foot long,

decurrent at the base, light green and shining, with oblong-acute coriaceous segments, four to six inches long, the lower one often lobed. Sori round or ovate. There are two forms of this species in cultivation.

Phlebodium.

7. D. longipes, J. Smith: Link.—A coarse-looking evergreen stove Fern, from the East Indies. Fronds glabrous, two to two and a half feet long, pinnatifid, decurrent at the base, coriaceous, with three or four large, broad, oblong, acuminate segments, six or eight inches long, deep green. Sori large, oblong, biserial, immersed. Rachis and stipes pale green; stipes more than half the length of the frond; lateral, articulated on a creeping rhizome.

8. D. melanococca, Hort. Amsterdam.—A tall slender evergreen stove species, from the East Indies. Fronds glabrous, pinnatifid, two to five feet long, almost lanceolate, with lanceolate-acuminate, membranous, undulated, distant, pale green segments. Sori large, round, uniserial, immersed, forming elevated protuberances on the upper surface of the fronds. Fronds lateral, articulated on a scaly, creeping rhizome.

9. D. capitellata, J. Smith: Wallich (P. juglandifolium, D. Don).-A neat evergreen stove Fern, from the East Indies. Fronds glabrous, pinnate, one to one and a half foot long, with oblong, ovate, mucronate, cuspidate, membranous pinnæ, which are round at the base and articulated with the rachis, glaucous, with a thickened white margin. Sori large,

round, uniserial. Fronds lateral, articulated on a scaly, creeping rhizome.

10. D. leiorhiza, J. Smith: Wallich (P. cuspidatum, D. Don) .- A very ornamental evergreen stove species, a native of Nepal. Fronds glabrous, pinnate, two to three and a half feet long, with lanceolate-acuminate bright green pinnæ, the inferior ones petiolate, six to eight inches long, upper ones adnate and decurrent. Sori round, uniserial, very large. Fronds lateral, articulated on a thick, creeping rhizome.

¿ DRYNARIA VERÆ, Bory.

11. D. quercifolia, Bory: Linnæus.—An extremely rigid evergreen stove Fern, having an extensive geographical range throughout the tropics of the eastern hemisphere. Fronds of two kinds: sterile-sessile, oblong-ovate, cordate at the base, sinuose or laciniated, with the vascular structure rigid, and permanent: fertile-stipitate, pinnatifid, with linear, acuminate, undulated segments, having a thick margin, and articulated with the rachis. Sori round, obliquely and rather irregularly disposed throughout the whole under surface of the frond. There are various well-defined forms of this species distributed throughout the Eastern hemisphere, but only two at present in cultivation; the one has cordate, ovate, sterile fronds, six inches long, with stipitate fertile fronds, two feet long, generally

soriferous throughout; the other has cordate-oblong, rigid, pinnatifid, sterile fronds, three to four feet long, forming a noble object, but is without fructification. The rhizomes are thick, scaly, and creeping. · The reader is requested to transpose this cut with that at page 62, which represents Dictymia; the present figure belongs to



Fig. 14 b.

ICTYMIA, J. Smith. (Polypodii sp., R. Brown; Dictyopteris sp., Presl).—Name derived from diktyon, a net; alluding to the netted venation.

Sori oblong, compital, transversely uniserial, receptacle immersed. Venation uniform, articulated, internal.

Fronds simple, glabrous, coriaceous. Rhizome creeping.—This genus is established on habit more than any technical character easily pointed out. The two species which it comprises are natives of New Holland and New Zealand. Their uniform reticulated venation distinguishes them from Drynaria, the areoles being all sterile. Fig. 14 represents the upper part of a frond of *D. attenuata* (nat. size).

1. D. attenuata, J. Smith: R. Brown.—An ornamental, evergreen, greenhouse Fern, from New Holland. Fronds simple, linear-acuminate, dark green, about a foot long, coriaceous, attenuated at the base. Sori oblong, uniserial, on the upper half of the frond. Fronds lateral, articulated on a creeping rhizome.

RYMOGLOSSUM, Presl (Pteridis sp. of Authors).—Name derived from drymos, a forest, and glossa, a tongue; alluding to the form of the fronds, and the native habitat of the plants.

Sori linear, continuous, marginal or intramarginal, produced on the transverse sides and junctions of the venules, forming a broad marginal or intramarginal soriferous band, which is pilose or squamiferous. Venation uniform, compoundly anastomosing, producing variously directed free veinlets. Fronds simple elliptical or lanceolate, coriaceous, from one to sixteen inches long. Rhizome erceping.—Comparing this genus, in its venation, with that of Drynaria and Selliguea, it is only

by the position of the linear continuous sori, that it is distinguishable. The distinguishing characters are a compound anastomosing venation, with the naked linear continuous sori running parallel with and near to the margin. Fig. 17 represents the upper portion of a frond of *D. lanceolatum* (nat. size).

1. D. piloselloides, Presl.—A dwarf evergreen creeping stove fern, native of the East Indies and Malayan Islands. Fronds of two kinds: sterile—elliptical or roundish-ovate, one inch high, attenuated at the base: fertile—linear, narrow, two inches high, attenuated at the base; both are lateral, articulated on a slender creeping rhizome. Sori confluent, covering the whole surface of the frond. This fern is at present extremely rare in cultivation, although in 1843 it was covering the end of a pine stove of the Duke of Northumberland's, at Syon.

2. D. lanceolatum, J. Smith (Tænitis lanceolata, Kaulfuss).—An ornamental evergreen stove fern, from Jamaica. Fronds uniform, from ten to sixteen inches long, contracted at the apex where they are soriferous, pale green and attenuated at the base; they are lateral, articulated on a creeping rhizome. Venation internal.

M. ENIOPSIS, J. Smith (Vittariæ sp. of Authors).—

Name derived from tainia, a fillet or band, and opsis, resemblance; from the long narrow outline of the fronds.

Sori linear, continuous, intramarginal, immersed in Fig. 17.
a groove. Veins simple, parallel, their apices combined, and forming a transverse sporangiferous receptacle. Fronds simple, linear-lanceolate, one to two feet long, plane or with the margin revolute.—The habit, venation, and external appearance of the species of this genus are precisely identical with those of the Vittarias; the only ground on which they are separated, is the position of the sporangiferous receptacle, which in Vittaria is marginal, and in Tæniopsis is intramarginal. Fig. 18 represents a frond of T. graminifolia (med. size).

1. T. lineata, J. Smith: Swartz.—A singularly narrow evergreen stove fern, from the West Indies. Fronds simple, glabrous, pendulous, one to two feet long, and about an eighth of an inch broad. Veins internal and very few, costa obsolete. Fronds lateral, forming a dense mass on a short creeping scaly rhizome. Sori intramarginal in a groove nearly the whole length of the frond.

2. T. graminifolia, J. Smith: Kaulfuss.—An ornamental evergreen species, from the West Indies. Fronds



Fig. 18



simple, glabrous, rather erect, about ten inches high, lanceolate-acuminate, undulated and attenuated at the base. Sori submarginal, continuous or interrupted, and confined to the upper half of the frond. Venation internal.

MTROPHYUM, Kaulfuss.— Name derived from antron, a cavern, and phyo, to grow; alluding to the hollows on the under surface of the fronds, from whence the spore-cases arise.

Sori linear, continuous or interrupted, reticulated; sporangiferous receptacle immersed in the substance of the frond. Venation uniform, reticulated; sides of the arcoles more or less sporangiferous. Fronds simple, linear-lanceolate or elliptical, coriaceous.—The character which distinguishes this genus from Hemionitis, is the immersed sporangiferous receptacle; the sori of Hemionitis being superficial. Fig. 19 represents the upper portion of a frond of A. lanceolatum (nat. size).

1. A. lunccolatum, Kaulfuss (Hemionitis lanceolata, Linnæus).— A delicate evergreen stove species, from the West Indies. Fronds simple, glabrous, one foot long, linear-lanceolate acuminate, attenuated at the base, slightly undulated, and of a light green colour. Fronds lateral, somewhat coriaceous, forming a dense mass on a short creeping rhizome. Venation internal.

MEMIONITIS, Linnaus.—A name used by Dioscorides, and said to be derived from hemionos, a mule, from the supposed sterility of the plant. In this sense, however, the name is here obviously inapplicable; for in addition to the ordinary method of propagation by spores, H. palmata is absolutely viviparous.

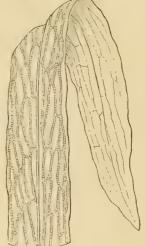


Fig. 19.

Sori linear, reticulated, superficial, and subsequently confluent. Venation uniform, reticulated, sporangiferous on the sides of the areoles, which are nearly equal. Fronds simple, cordate palmate or pinnate, glabrous or villose.—

The species arranged under this genus are exceedingly beautiful, of dwarf habit, and among the most interesting of all dwarf ferns. The character by which they are easily recognised is the superficial reticulated sori. Fig. 20 represents a frond of *H. palmata* (med. size).

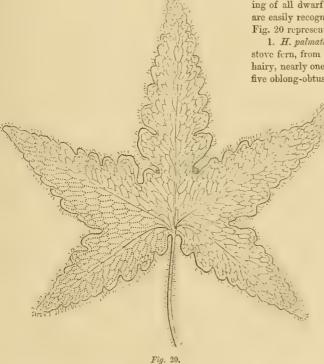
 H. palmata, Linnæus.—A very elegant evergreen stove fern, from Brazil and the West Indies. Fronds hairy, nearly one foot high, cordate and palmate, with five oblong-obtuse or acuminate segments, crenulate or

bluntly lobed. Fertile fronds erect; sterile nearly horizontal and proliferous in the sinus; both terminal, adherent to a fasciculate rhizome.

ERATOPTERIS, Brongniart.

—Named from keras, a horn, and pteris, a fern; alluding to the appearance of the fertile fronds.

Sori linear, continuous, parallel, superficial, produced on the length-ened transverse sides of the venules, and concealed by the reflexed margin of the segments. Veins transversely elongated, and distantly anastomosing. Fronds flaccid, of two kinds; the sterile pinnatifid or bipinnatifid, sinuate and viviparous; the fertile contracted, decompound, membranous, multifid, with linear forked and viviparous segments having their margins reflexed and indusiform.



The peculiar habit and structure of this genus renders it difficult to determine its real affinity. The sporecases are sessile, large and globose, furnished either with a broad nearly complete, or very short nearly obsolete ring. It was originally associated with Gleicheniaeew. Fig. 21 represents portions of the sterile and fertile fronds (nat. size), with a portion of the fertile frond magnified, showing the position of the sori. 1. C. thalietroides, Brongniart (Ellobocarpus oleraceus, Kaulfuss).—A very singular annual aquatic stove fern,

native of the tropics of both hemispheres. Fronds glabrous, of two kinds: sterile bipinnatifid, one to one and a half foot long, reclining, with oblong obtuse segments; fertile contracted, erect, three or four times pinnate, one and a half to two and a half feet high, with linear revolute segments; both forms are viviparous, of a light green, with the stipes nearly quadrangular.

C. Parkeri, J. Smith (Parkeria pteroides, Hooker et Bauer), was raised by Mr. H. Shepherd, of Liverpool, and so closely resembles the Ceratopteris thalictroides in all respects except the elastic ring of the spore case, that it is only to be discriminated by the aid of a very powerful microscope. Mr.



Smith informs us that he has raised C. thalictroides from the spores of the present supposed species.

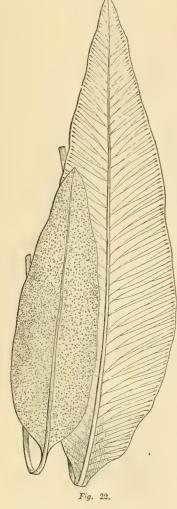
Sub-order—Polypodiaceæ: Tribe—Acrosticheæ. Sect. I.—Orthophlebieæ, J. Smith.—Veins free.

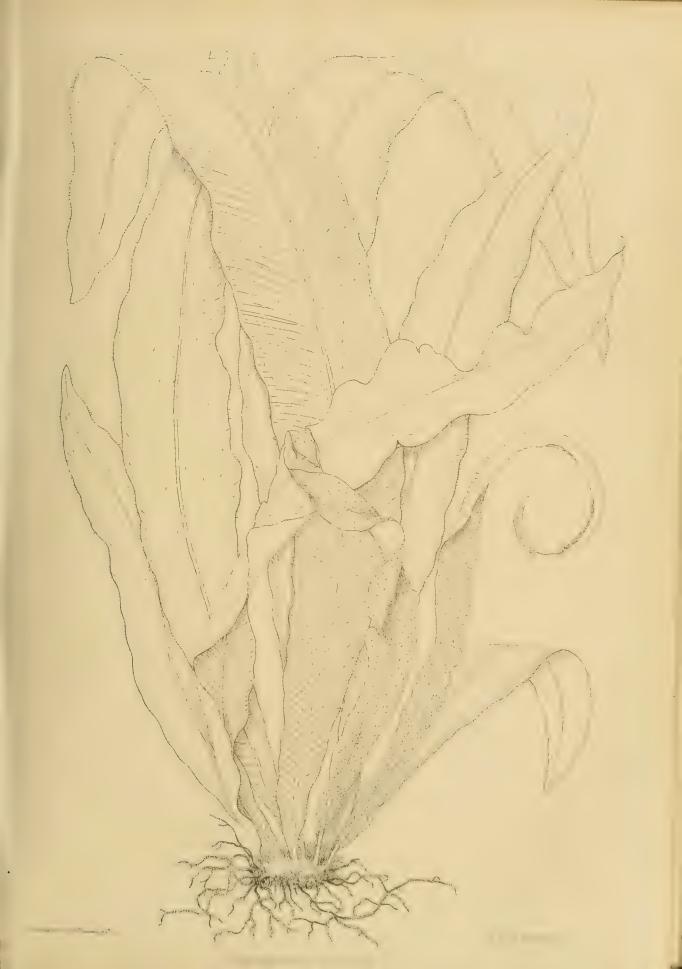
The species forming this extensive natural group are probably the easiest of all Ferns to recognize, from the sori being spread generally throughout the under surface of the frond. The species number more than one hundred, and were originally comprehended by authors under two or three genera; but they have latterly been subdivided into nearly twenty. They have distinct sterile and fertile fronds, similar to Lomaria in the tribe Pterideæ, but are easily distinguished from that group by the absence of an indusium, with which the Lomarias are furnished. Their most obvious point of distinction from Polypodieæ, is in the sori being amorphous, that is, not produced in round or linear masses, but closely occupying an irregular portion or the whole of the fertile disk, which in one or two genera is not confined to the inferior surface alone, the contracted rachiform segments being sporangiferous on both sides.

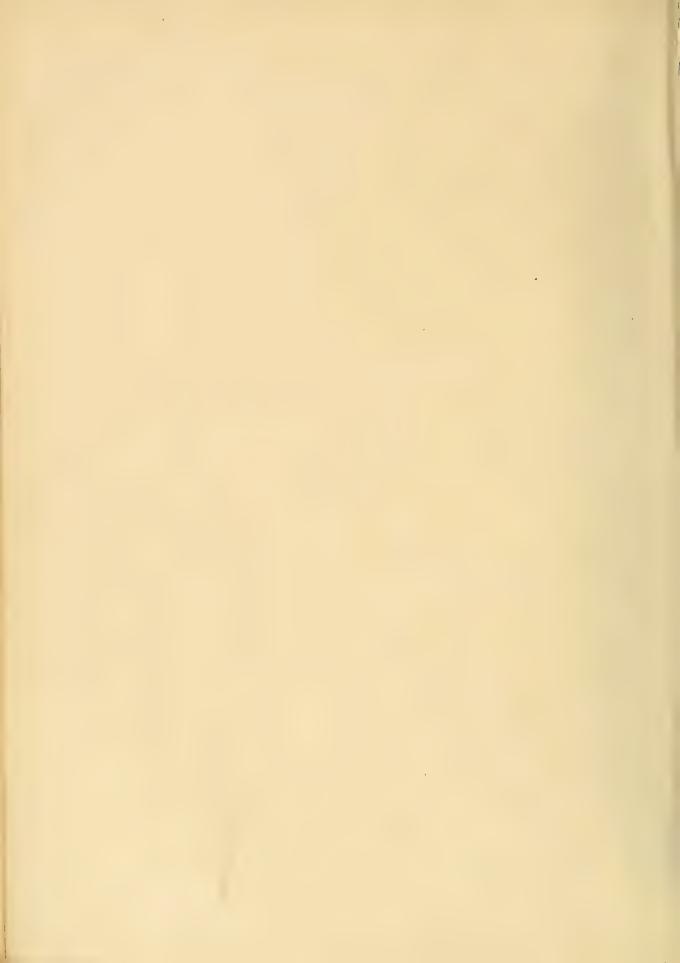
MLAPHOGLOSSUM, Schott (Acrostichi, sp. of Authors).—Named from elaphos, a deer, and glossa, a tongue; the small simple fertile fronds being supposed to resemble the tongue of the deer. In most modern catalogues the name is strangely enough derived from elephas, an elephant, and glossa, a tongue—elephant's tongue!

Sori amorphous, thickly covering the whole under surface. Veins simple, or forked, internal; venules parallel, their apices free and clavate, terminating within a thickened margin. Fronds simple, from a few inches to two feet long, linear-lanceolate, coriaceous, glabrous pilose or squamose.—This genus is readily distinguished from its congeners by having simple fronds, with forked free veins. Fig. 22 represents a sterile and fertile frond of *E. conforme* (med. size).

1. E. conforme, Schott: Swartz.—An erect dwarf evergreen stove fern, from the Cape of Good Hope. Sterile fronds, glabrous, oblong-acuminate, attenuated at the base, from six to twelve inches high, coriaceous, deep green. Fertile fronds small, ovate or oblong-acuminate, from six to ten inches high. Both forms are articulated near the







rhizome. This species attains the height of a foot and a half in its native locality. Rhizome scaly and creeping.

2. E. crassinerve, Kunze.—An evergreen stove fern, from the West Indies. Sterile fronds glabrous, oblong-ovate, bluntly acuminate, from twelve to eighteen inches long, attenuated at the base, thick and coriaceous, undulated, dull green. Fertile fronds oblong-ovate, one foot high, attenuated at the base. Both forms are articulated near the base of the stipes, and are lateral on a scaly short creeping rhizome.

3. E. callæfolium, J. Smith: Blume.—A glabrous evergreen stove species, from Java. Sterile fronds ovate, or oblong-acuminate, a foot or more long, coriaceous, deep green, shining, undulated, roundish or somewhat attenuated at the base; rachis and stipes of a dark purple beneath. Fertile fronds erect, ovate-elliptical, acuminate, one foot high. Both forms are articulated near the rhizome, which is scaly and creeping.

4. E. longifolium, J. Smith: Jacquin.—A glabrous evergreen stove fern, from the West Indies. Sterile fronds coriaceous, bright green, lanceolate-acuminate, one to one and a half foot long, slightly undulated, attenuated at the base. Fertile fronds erect, lanceolate-acuminate, one to one and a half foot high, attenuated at the base Both articulated near the base of the stipes; lateral, on a scaly creeping rhizome.

5. E. scolopendrifolium, J. Smith: Raddi.—An ornamental evergreen stove species, from Brazil. Sterile fronds oblong-lanceolate, acuminate, twelve to fifteen inches long, undulated, pale green, with stipes one third the length of the frond; stipes, rachis and margin of frond covered with fimbriate-acuminate cordate brown scales. Fertile fronds small, erect, oblong-lanceolate, acuminate, one foot long, with a stipes of eight inches. Both forms are articulated near the base of the stipes, and are lateral on a short scaly creeping rhizome.

6. E. villosum, J. Smith: Swartz.—An ornamental evergreen stove fern, from Jamaica. Sterile fronds hairy, oblong-lanceolate, acuminate, undulated, pale green, about a foot long. Fertile frond narrow, oblong-lanceolate, acuminate, eight inches long. Both forms are articulated near the base of the stipes, and are lateral, on a scaly creeping rhizome.

7. E. Dombeyanum, Fee.—A scaly stove evergreen species, from South America. Sterile fronds linear-obtuse, one foot high, attenuated at the base and densely covered throughout with stellate scales. Fertile fronds linear, narrow oblong-lanceolate, one foot high, stipes more than half the length of the frond. Both forms lateral, articulated, with a short scaly creeping rhizome.

# OUR DIAGRAMS OF THE PICOTEE AND CARNATION.

By Mr. G. GLENNY, F.H.S.

WRITER in a country periodical has attacked us upon a subject which is far beyond the understanding of his circumscribed mind, and by attempting to be humorous at our expense, he has made himself appear more than usually ridiculous. We premise that the diagrams of the Properties of Flowers and Plants are authentic. Whether good, bad, or indifferent, they have passed the ordeal of public opinion, and have been acted on many years: the earliest were published in 1832. After many discussions at meetings and on paper, it has been for years conceded by the very best florists in the kingdom—

- 1. That if a flower could be produced in every way like the model laid down, IT WOULD BE PERFECTION.
  - 2. But that it never can be attained.
  - 3. Therefore, that the flowers which approach nearest must be the best.

Ever since these properties were laid down, flowers have rapidly advanced; and although many have dabbled in the properties of this that and the other, pretending to some novelty, not a single point has been shaken, and the models stand as the guide in all societies.

We have published a number of diagrams exemplifying the forms laid down in the said properties. We profess to be authentic, not new; and the writer in question makes a silly attack upon the Picotee and Carnation, which, although described and published many years since, and acted upon by the best florists, he pecks at in perfect ignorance of the source, the work he ridicules, and the object. His attack may be thus described: First, "he ventures to say"—what the author said many years ago—that such forms "never will be attained." A great discovery, truly! But he goes on to say why—"And for this rery simple reason" (simple enough!) "the petals in the same tier are of two widths" (not true, by-the-by—but that's nothing), "and this is a freak or law which nature never will adopt, I'll warrant." Nature is fortunate in being able to find such a security for her good behaviour; but the writer is unfortunate. Nature is more addicted to irregularities in the Dianthus tribe than in most others, and plays all manner of antics with the guard petals; sometimes poking them up in the midst of the little ones, and sometimes producing the little ones below. In fact, the tiers of petals in Carnations and Picotees comprise just such as the florist thinks fit to put there. However, all this is beside the mark, and only shows the profound ignorance of anybody who would become bail for Dame Nature never adopting petals of two different widths in the same tier. We have found that she rarely

condescends, in some varieties, to place them in tiers at all—that we have to do the work for her. He then asserts that Hollyoak's Duke of Rutland is a better actual flower than the model itself, which is simply an untruth-told, we hope, in utter ignorance of its falsehood; and then falls to ridiculing our model for showing forty-two petals in seven tiers, and resembling a rosette. This writer beats Columbus for discoveries. He is the first man who has found out that three tiers of petals make a better flower than a greater number. He is the first who has discovered that a florists' flower can be too accurate in its form, too perfect in its arrangement; and he exultingly says-"If these had appeared before the trial exhibitions" (having appeared eight or ten years before, at the least), "surely there would have been just cause for our northern friends disclaiming the southern model of a good Picotee." This gentleman has given us a striking proof that "a little learning is a dangerous thing." He writes in thorough ignorance of all the facts that bear upon the case. The northerns do not disclaim the southern model of a perfect Picotee, for it has not an imperfect petal, nor a petal misplaced; it is perfection, which they say, with the author, it is impossible to attain. What they disclaim is not four, five, six, or seven tiers of perfect petals geometrically true; but they denounce our southern mops, which they say, and often truly, exhibit neither tiers nor uniform petals, but a confused mass of imperfect parts, some with colour, some without, but lacking uniformity and character. The writer was quite innocent of any knowledge of another fact, that the majority of the attendants at the trial exhibition were as familiar with his ten years' old novelties, the offending diagrams, as they were with the ten years old flowers before them, and for his comfort he should be informed that the whole of the prizes were awarded according to these very diagrams, and the rules laid down with them. The flowers that approach nearest to the perfection exhibited in the diagrams that disturb the equanimity of this new Floral dictator were placed highest in every class. We need hardly tell those who have read the inflated paper we have noticed, that a flower with four or five tiers of bad petals is not so near perfection as one of three tiers of good ones. It is no great proof of his sagacity to ridicule what he does not understand. If the southerns are careless of the quality of their petals, and rely too much on fullness without quality, it is not so because the diagram encourages any such fancy; but the northerns do not despise the number of tiers or of petals; they disclaim the toleration of any bad ones, and prefer showing a bloom thin to showing it bad. Had the writer circulated his article among all the florists of England without any name but his own, we should not have honoured the attack with a notice; but as his lucubrations might be mistaken for the opinions of the editor, we felt we might as well bring him down to his proper level, and place him among those indiscreet writers who are ambitious to appear in print, without the prudence to confine their subjects to what they understand.

#### THE NATIONAL FLORICULTURAL SOCIETY.

VIPON the wrappers of the two last parts of this magazine some remarks have been made upon a new society for judging Seedling Florists' Flowers, and we have now the pleasure to state that we have attended the preliminary meetings, and that the society will have been fully organized before this meets the public eye. The object of the projectors is to afford every person who may raise a seedling flower, the means of ascertaining whether it is of sufficient merit to send out: for, though a flower to the raiser may appear very beautiful, it, nevertheless, in the estimation of competent judges, may be entirely worthless. The management is to be under a committee of forty-eight persons, and, at the least, twenty judges will be appointed, and such as require it will have their expenses for judging defrayed by the society. The large room of the Horticultural Society, 21, Regent Street, has been engaged for a series of years, and the support of nearly all the leading florists and amateurs in the United Kingdom has been secured. The society will not only undertake to pronounce judgment upon the good things, but it will denounce bad ones, so that those who are guided by it in their purchases will have a guarantee, such as has never before existed in this country. Certificates, we believe, will be awarded to first, second, and third class flowers, and these certificates will be signed by the judges, the chairman of the meeting, and by the secretary; so that the chance of two or three meeting together and rewarding each other's flowers, on the "ca' me ca' thee" principle, will be entirely done away with. For our own part we shall be very cautious in buying new things which have not been sent for the opinion of this society; and when such an ordeal is established, we must decline giving any opinion upon new flowers, and trust that all our correspondents will send their new flowers direct to the secretary of the society. The first exhibitions will be held on April 3rd and 24th, to which any respectable person may obtain admission upon application to a member, or to the secretary of the society, John Edwards, Esq.





"I were good time

Curled by & Then restanden

Bouvardia leiantha.

## BOUVARDIA LEIANTHA.

Nat. Order .- CINCHONACE.E.

Generic Character.—Bourardia, Salisbury.—Calyx with a subglobose tube, adherent to the ovary, limb superior, fourparted, the lobes—linear-awl-shaped, sometimes with intermediate teeth. Corolla superior, tubular-funnel-shaped, clongated, velvety-papillose outside, glabrous or bearded within, throat naked, limb four-parted, spreading, short. Stamens four; filaments very short or almost wanting; anthers linear, included. Ovary inferior, somewhat exserted at the apex, two-celled; ovules amphitropous, numerous, inserted on an orbicular placenta on each side of the dissepiment; style filiform; stigma bi-lamellar, exserted. Capsule membranous, compressed-

globular, two-celled, septifragously two-valved at the summit, Seeds numerous, compressed, peltate, imbricated, surrounded by a membranous wing.—Mexican shrubs; leaves opposite or in whorls, stipules narrow, acute, adnate to the petioles on each side; peduncles terminal, three-flowered or three-forked, corymbose.—(Endlicher Gen. Plant. 3265).

BOUVARDIA LEIANTHA, Bentham.—Smooth-flowered Bouvardia.—Leaves ternate, ovate, acuminate, rounded or sub-cordate at the base, slightly hairy above, pubescent-villous beneath, as are also the branchlets; corymbs sub-trichotomous; teeth of the calyx one fifth the length of the glabrous tube of the corolla.

ESCRIPTION.—Robust; the stem erect, downy, with a somewhat decurved pubescence, two and a half to three feet high, branched above, the divisions terminating in the inflorescence. Leaves ternate, dull green, ovate acuminate, nearly four inches long, rugose, clothed on both sides with soft short white hairs, most conspicuous on the raised nerves of the lower face. Stipules subulate, acute. Inflorescence in very compound trichotomous cymes, from the axils of smaller lanceolate bract-like leaves; bracts of the peduncles linear. Calyx with five short acute linear teeth. Tube of the corolla obovately four-cornered, nearly one inch long; limb of four triangularly-ovate acuminate spreading lobes, of a rich deep vermilion colour; stamens included, the filaments adherent to the tube of the corolla, and equal to it in length; style half the length of the tube, with a two-forked stigma.

History, &c.—A distinct and freely-blooming species from Guatimala. It was grown last summer in Mr. Salter's Nursery, at Hammersmith; where the plant from which our drawing was taken continued to blossom from July to November.—A. H.

CULTURE.—It is singular that a family of plants so rich in colour as this is should not be more generally cultivated than it is, for certainly a more gorgeous bed for the flower-garden, than one produced by a few dozens of Bouvardias planted side by side, it would be difficult to imagine. Years back, in some old gardens in the north of England, Bouvardias used to be seen in great abundance, and presented splendid masses of colour in the old mixed borders, and also as pot specimens for the greenhouse stage. They are propagated with great facility, both by cuttings of the young wood and by pieces of the roots cut into lengths of one inch each. In both cases the cuttings should be placed in a gentle bottom heat, and those formed of the young shoots must be kept tolerably close. When they have grown to the length of one inch, pot them singly into small pots in a light rich compost, and nurse them with care until they are established. Old plants, while in a dormant state, may also be increased by division of the plant, as each shoot with a root to it will make a plant. Plants so obtained, or from cuttings of the previous year, are the best for planting out in the flower-garden, as if they are not strong they rarely flower satisfactorily. The proper time to divide the old plants is in March; each part should be potted in rich light compost, such as loam, leaf-mould, and rotten dung, and they must then be placed in a foreing-house or hotbed to induce them to start vigorously, and until they are thoroughly established. Afterwards move them to the air, so as to get them thoroughly hardened by the time they are planted in the garden in May. The soil in which they are planted should be rich, deep, and well drained, and the situation must be rather sheltered. During the winter the plants may be kept dry under the greenhouse stage, or in a shed or cellar. The subject under notice is a very pretty addition to this useful tribe of plants, and, flowering late in the autumn, is very suitable for pot cultivation for the greenhouse.—A.

## THE CHEMISTRY OF SOILS AND MANURES.

By Dr. A. Voelcker, Professor of Chemistry in the Royal Agricultural College, Chrencester, inorganic matters—alumina, iron.

M LUMINA.—Like Potash, Soda, Lime, and Magnesia, constituents of fertile soils, considered in a former paper (p. 14), Alumina is a compound of a metal—Aluminum—with Oxygen, which occurs very abundantly in the mineral kingdom, both free, or uncombined, and in combination with

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acids. Crystalized pure Alumina constitutes the rare and precious hard stones, sapphire, and ruby; uncrystalized or amorphous Alumina, on the other hand, is a white, tasteless, voluminous, powdery substance, which may readily be obtained by adding a solution of carbonate of soda to Alum. The white precipitate, produced in this way, is the earth of Alum, or Alumina. It constitutes a large proportion of all shaley and slaty rocks, and is the principal ingredient of pipe, porcelain, and agricultural clays. All clayey soils owe their tenacity, stiffness, and power of retaining moisture to the presence of alumina, and exhibit these properties in so much higher a degree, the larger the proportion of Alumina which enters into their composition. Alumina, however, is seldom found in soils in a free or uncombined state, but exists in them as well as in clays, in combination with Silica. Pure pipe or porcelain clay is a finely-divided chemical compound, consisting of variable quantities of Silica, Alumina, and water. Silica always preponderates, amounting to from sixty to seventy per cent, of the whole. Agricultural clays are mixtures of pure clays with more or less sand, free alumina, lime, magnesia, oxide of iron, and silicates of potash and soda. The colour of these clays is generally due to a considerable portion of oxides of iron. The complex nature of such clays will become apparent by the subjoined analysis of clays, from Dumbleton, made in my laboratory:—

									No. I.	No. II	No. III.
Water of combinati	ion ai	ad or	gani	ic ma	tter				7.69	 6.62	 6.68
Inorganic matter so	luble	in n	iuri	atic a	eid:-	-					
Oxides of iron,									8.24	 7.33	 8.63
Alumina,									8.04	 10.62	 9.25
Carbonate of li	me,								1.12	 .70	 .19
Magnesia									.62	 .12	 .56
Potash and sod	la,								.73	 1.04	 1.13
Silica, .	,								.09	 .06	 .08
Inorganic matter in	nsolu	ble in	aci	id :—							
Silica .									61.71	 63.36	 61.42
Alumina .			. }					<i>(</i> .	10.04	 7.11	 9.66
Lime			. }	in a	state o	f sil	icate,	₹	.44	 .54	 .24
Alumina . Lime Magnesia .			. )					1	.34	 .39	 .34
Alkalies and lo										2.11	
								_			100.0

Alumina is not usually found in the ashes of plants, and is therefore not considered as directly contributing to the nourishment of plants. The principal agency of Alumina in soils appears to be of a mechanical kind; indirectly clays are regarded as supplying the wants of plants by the remarkable power they possess of absorbing ammonia from the atmosphere, and retaining, not only this volatile substance, but also the easily soluble alkaline salts of the manures. Without this kind provision of nature the highly fertilizing alkaline salts would be dissolved by the first heavy rain falling on the land, and deposited in the subsoil; and the manures would thus, in a great measure, be rendered useless.

6. Iron.—Except in meteoric stones, Iron is not found in nature in a metallic state; but combined with Oxygen, Sulphur, and other elements, Iron is spread all over the world. When Iron is exposed to a moist atmosphere, it soon loses its brightness, and becomes covered with rust—a substance which, being a combination of Iron with oxygen, is called by chemists, Oxide of Iron. Oxygen, according to circumstances, unites in more than one proportion with Iron, and gives rise to several oxides, of which the black-coloured or protoxide of Iron, containing the smaller amount of oxygen, and the red-coloured or peroxide of Iron, containing the larger proportion of oxygen, are the more important. Both the black or protoxide, and the red or peroxide of iron appear as constituents of almost all soils. The red oxide is the most abundant, and to its presence the red colour of many soils is due. The subsoil of red soils often consists of blue or greyish clays, which owe their blue or greyish colour to the presence of protoxide of iron. When such a subsoil is brought to the surface by the spade, the blue or grey colour gradually turns red. This change in appearance is the result of the atmospheric oxygen uniting with the protoxide of iron of the clay, and converting it into the red or peroxide. Oxide of iron is found in all ashes of plants, in the blood of animals, and appears, therefore, to exercise an important influence on vegetable and animal life.

Carbonate of Iron, which forms the crystalized spathose iron-stone, is found here and there in the soil, and more frequently dissolved in the carbonic acid of some natural springs. In such waters an ochrey deposit, consisting chiefly of oxide of iron, is formed on exposure to air. A similar ochrey deposit is seen sometimes at the bottom of drains and ditches. On examination, however, it will generally appear that the ochrey mass is not pure oxide of iron, but that it contains a large quantity of organic matters, being principally crenic and apocrenic acid. When spring-waters, containing oxide

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of iron dissolved in carbonic acid, or iron salts, meet with crenic or apocrenic acids, present in all cultivated soils, ochrey deposits, the result of the union of these acids with oxide of iron, are always produced.

Iron and Sulphur unite in several proportions with each other. One of these combinations, iron pyrites, a brass-coloured metallic substance, frequently crystalized in regular cubes, accompanies coal, many clay slates, and other rocks, and is consequently found occasionally in arable soils. Iron pyrites, heated strongly, gives off sulphurous fumes, arising from the combustion of part of the sulphur of the pyrites. The injurious, disagreeable, sulphurous smell some kinds of coal disengage in the grate, when lighted, results from the presence of iron pyrites in the coal. Small quantities of iron-pyrites in soils exercise no injurious effects on vegetation; large quantities, on the contrary, may render a soil totally barren. In the presence of organic matter, water and air, iron pyrites is subject to a rapid decomposition; in consequence of which a highly obnoxious gas, sulphuretted hydrogen, and a salt, sulphate of protoxide of iron, are formed; both products, though unprejudicial in small quantities, act decidedly injurious on vegetation, when present in the soil in quantity.

Sulphate of Iron, which in most cases is produced from iron-pyrites, is a compound of sulphuric acid, with protoxide of iron, and is more generally known under the name of green vitriol. Sulphate of iron and the substance from which it is formed, iron pyrites, occur together in some soils. Such soils are always unproductive, and not unfrequently completely barren. Some time ago a striking example came under my notice, which is well calculated to serve as an illustration of the services which chemistry is capable of rendering to the gardener. A sample of a soil from Lancaster was sent to me for examination by a gentleman, who described to me the land from which it was taken, as of the very worst description, which absolutely refused to grow anything. Peas and other seeds rotted when sown in that part of the garden from which the sample was taken, and it was naturally suspected that some injurious substance was present in the soil. On examination I soon discovered the cause of barrenness, which, I have no doubt, must be ascribed in a great measure to a quantity of sulphate of iron, or green vitriol, amounting to no less than six per cent. of the whole weight of the soil. Iron pyrites was also present in large quantities, and thus a source for the formation of green vitriol was afforded. Many failures in medicine and horticulture can be traced to the mistaken causes of sickness and sterility. In this case, however, one of the chief causes of barrenness, no doubt, resulted from an unusual large proportion of sulphate of iron; and no difficulty, therefore, remained of pointing out the remedy to prevent the noxious effects of this salt. Lime added to its solution combines with its sulphuric acid, forming gypsum, a fertilizing ingredient of farm-yard manure, and the oxide of iron of the green vitriol is left behind in an insoluble state. We possess, therefore, in quicklime, chalk, limestones, and all sorts of marl, a ready means for sweetening such soils, which are generally sour, and are able to remove in this manner the primary cause of infertility.

#### ON THE CULTIVATION OF VANDA.

BY MR. T. APPLEBY, OF THE PINE-APPLE NURSERY, LONDON.

MO genus of orchids is more deserving of culture than the Vandas, whose noble evergreen foliage, Al fine vigorous habit, handsome even when not in flower; and, above all, truly splendid and highly fragrant blossoms render them worthy of being in every collection.

These fine plants, being all natives of the warmer parts of the East Indies, require the same treatment in regard to heat, moisture at the root, moisture in the atmosphere of the house, the material in which to grow them, and in their seasons of growth, flowering, and rest. similarity of culture renders their treatment uniform and easy. There are, besides, several other genera of these singularly interesting plants, from similar climates, that flourish satisfactorily if subjected to the same treatment; and they are now so numerous, that it is almost necessary to place them in a house devoted to them alone, which structure may very appropriately be named the Indian House, in contradistinction to another devoted to the culture of Orchideae, from the more temperate climate of Southern America. In the countries from which the Vandas and similar genera are brought, the heat at certain seasons is excessive, especially in the lower parts where these plants are located. It is found necessary, in some degree, to imitate the natural climate in artificial ones provided for tropical plants; and on this point experience has proved that when these plants are growing, a heat of 85° by day, and 70° by night, is the proper temperature for them. The season to apply this high temperature, thus encouraging vigorous growth, should be when the heat of our own country is at the highest; for then there is also the greatest amount of light, an element equally necessary for the well-being of the plants as heat. The season of growth, then, should commerce in May, and continue till September.

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How is this heat and light to be obtained? This question naturally brings us to consider the kind of house best adapted for their culture, and the best mode of heating it. In these enlightened days, science, ingenuity, and skill have brought the art of erecting hothouses and heating to, we might almost say, the utmost perfection; and, like most other essays of art, the most simple and least complicated means are found the best to produce a certain result. The form of house for orchids cannot be too simple. Its aspect should be east and west-that is, the ends of it should point north and south. The form a parallelogram of any dimension; the roof only need be glass; the sides brick or stone. The angle of the roof should be not more than 36, or, at the most, 40 degrees. If it is more, there is danger to be apprehended to the plants from drip; but if the angle is rather sharp, the condensed water, instead of dropping upon the plants, will run down the glass on each side to the front where it may be collected and carried off. The best mode of heating yet discovered is, undoubtedly, by means of circulating hot water in pipes of sufficient size or number to give out more heat than is wanted, it being always more safe and easy to reduce the temperature by using less fire, or by the admission of fresh cooler air, than it is to force up a high heat with an insufficiency of pipe. To obtain moisture in the air, it is desirable to run part of the pipes through tanks, so shallow as only, when filled with water, just to cover the pipes. This is a superior method to that of having the tanks supplied direct from the boiler, because when a drier atmosphere is desirable,



VANDA SUAVIS: AS EXHIBITED BY MESSRS. VEITCH.

the tanks may, by means of taps, be easily emptied, and the effect attained.

Moisture in the air should always be in abundance during the growing season. If the weather should be so hot out of doors that artificial heat may be, in a great measure, dispensed with, it will be necessary to moisten the air by other means than the tanks alone. It may be sufficiently given by means of copious floodings on the floors, thoroughly wetting the walls, syringing the plants morning and evening, and shutting up the house early in the afternoon. Water at the root, an element necessary for the growth of all plants at certain seasons, must also be liberally supplied to Vandas, when growing freely. It must be of the same temperature as the air of the house. Rain water is the best.

As to the best material in which to grow them, I believe that baskets made of oak branches or hazel rods, and filled with sphagnum (white bog-moss), mixed

with broken potsherds and pieces of charcoal, will be found the most suitable. The baskets may either be hung up to the roof, or if the house is low, placed upon pots to bring them near to the glaas.

The season for growth has been mentioned; and as the days shorten, and the heat of the summer declines, the season of rest ought to commence by lowering the temperature to 70° by day and 60° by night. This season of comparative rest should commence at the end of September, and continue till March. In the lackest days of winter the temperature should be reduced still further to 65° by day and the lackest days of winter the temperature should be reduced still further to 65° by day are the lackest days of winter the temperature should be reduced still further to 65° by day are the lackest days of winter the temperature should be reduced still further to 65° by day are the lackest days of the flowers to fill and growth, the plants will not require any water at the lackest days of the flowers to fill and appear in due course; whereas, if the heat and moisture are continued all the year, the plants will keep growing, and rarely, if ever, flower. The season of flowering will follow the season of rest. As the flower-spikes advance, the heat must be increased; but a very moderate supply of moisture, either in the air or at the root, must be given. In their native country they flower during the dry season that immediately succeeds the cool one. So they will in our stoves, if the system of treatment I have described above be followed. The flowering

season, then, will be from March to the end of May, or perhaps June, if required. Immediately after that is over, the growing season, with its requisite quantity of heat and moisture, will recommence. Then occurs the proper time to give them a shift, if they require it, by renewing the baskets and the sphagnum. Give them larger baskets as they grow, and require more space for their roots.

The following is a selection of the species most worthy of cultivation:—

V. cœrulea. Khasiya-hills of India.—The noblest of the race, remarkable for the size of its whole-coloured bluish-lilac flowers, which measure three to four inches in diameter, and grow in long upright racemes of eight or ten blossoms. It has been lately bloomed by Messrs. Veitch, and has been erroneously called V. cœrulescens in several publications. The sepals and petals are large, membranous, and oblong; the lip small, leathery, deep blue, and linear-oblong in form.

V. cristata. Nepal.—One of the most scarce of the genus, and very beautiful. The flowers are produced on long peduncles, generally singly, but sometimes in pairs; they are large, and of a creamy white; the labellum mottled, and striped with rich dark brown. They last a long time in bloom.

V. fusco-viridis. East Indies.—This is a species very little known. As the name implies, the colour is a brownish green, approaching to yellow. The flowers are of considerable size, lasting in bloom full two months, and are very fragrant.

V. insignis. Java.—A well-named species, for it is indeed a noble plant, with equally noble flowers. They are large; grow frequently six to ten in a raceme; yellowish, beautifully spotted with crimson, and very fragrant.

V. suavis. Java: V. tricolor. Java.—These two are very beautiful species, in the way of Vanda

insignis; and together with it are, perhaps, the most beautiful of the species.

V. Roxburghii. India.—A handsome growing plant, but not a free flowerer; no doubt, because the plants are kept too long in a continued moist atmosphere. The sepals and petals are yellowish, spotted with red inside, and rose and white outside; the labellum is white and pale red. There is a variety with blue spots instead of red or rose.

V. teres. Various parts of India.—A very fine species. The petals are deep purple, shading off to the margin; the sepals pale cream colour; the lip large and beautifully variegated with crimson

and yellow; a tall growing species, seldom flowering till three feet high.

V. unicolor. India.—Not a very handsome species, but a free flowerer; and the flowers are large

and continue fresh a long time. They are light brown, changing to a tawny yellow.

V. violacea. Manilla.—The sepals and petals of this are white, tinged with violet, the labellum, richly striped with rich purple. It is a beautiful species, flowering when very dwarf. The season of blooming is about February, a time when flowers are scarce, even among orchids.

## Garden Dints for Amateurs.

#### APRIL.

MHIS, like the preceding month, is a busy time with good gardeners, and those who are in any way & behind with their work must not lose a moment until every department under their charge is in proper order. The flower garden will begin to wear an interesting appearance, more especially where a good collection of Alpine or rock plants and bulbs are cultivated, and among shrubs, the Roses, Berberis, Daphne Mezereum, Forsythia, and many more, will be gay and lively. If the planting of shrubs and specimen plants has not been completed, no time must be lost, though if necessity requires it, shrubs and large ones, too, may be planted as successfully in May as any month in the year; indeed, in exposed situations, and where the plants are obliged to be taken from warm nursery beds, we would rather plant in May than any other month in the year. This, we are aware, is contrary to general practice, but we speak from experience; and having planted some hundreds at that season, without losing ten in a thousand, we know the practice may be followed with advantage. Newly planted trees must be properly attended to as to watering and staking, and if they can be mulched with leaf mould they will be much benefited. Finish pruning Roses. Regulate the beds containing the tender kinds, as the Tea, Bourbon, and China varieties, and where it is customary peg them down at once, so as to induce them to break strongly from the base. Manure the beds, or give, when necessary, a good soaking of manure water. All beds and borders should now be deeply heed over when the soil is dry, but avoid using the rake at present; indeed, in flower gardens a good workman should not require to use the rake at all. Mowing must be attended to regularly, and every plant of the garden must present a neat and finished appearance.

Among Florists' Flowers the potting of Pinks, Carnations, and Picotees, if not already done, must be completed immediately, and Auriculas and Polyanthuses must be carefully attended to, guarding them cautiously against cutting north-east winds, but giving them the advantage of full exposure in mild mornings. Tulips are forward, and in the event of cold frosty winds will require ample protection, or the freezing of the young flower bud may do irreparable injury. Attend carefully to beds of Ranunculuses and Anemones: if necessary press the soil around the forward plants, and keep a sharp look out for wireworm and other insects. Beds of Pansies will soon be in full splendour, and a most interesting display they make; remove superfluous flowers, and protect the plants from cutting winds. Our best florists now grow them in pots, in frames under glass, by which means they get unusually large and brilliant-coloured flowers. Should the weather be dry don't forget the manure water. Fork over the ground for Hollyhocks and Dahlias, leaving it rough; the former may be planted out at once. Propagate Phloxes and Dahlias, and as the young plants get established harden them off.

Many of the more early-blooming varieties of Greenhouse and Stove plants will be advancing rapidly, and the houses will begin to wear a spring-like appearance, as some of the earlier kinds of Chorozemas, Dillwynias, Pimeleas, and Leschenaultias will soon be in bloom. Attend properly to these, and see that they do not suffer from the want of water. The potting of specimens should have been completed before this time, but towards the end of the month some of the free-growing kinds may be ready for a shift. Encourage Achimenes, Gloxinias, and the like, and start a good batch for a Sow Balsams, Cockscombs, Globe Amaranthus, Schizanthus, and other tender summer supply. Annuals, and forward all but the Schizanthus in a hotbed frame. In the Stove some of the winterblooming plants will now be getting shabby; cut them down and set them aside for a time, or if they are getting too large throw them away, preserving, of course, a supply of cuttings for young plants to supply their places. Syringe daily, and use manure water to such plants as are coming into bloom, not only to encourage the plants but to give brilliance to the flowers. Ventilation must be attended to in time, and with caution, recollecting that if the weather is mild you cannot give too much air so long as the temperature is kept up, but cold winds must be cautiously guarded against. The shades will soon be wanted: therefore get them fixed, for during the gleamy weather of April, and the changes to which plants are necessarily exposed, they are, if not shaded, more likely to get scorched than during the bright days of summer. Avoid shading, however, except in cases of absolute necessity, and then use it no longer than you are obliged to do so. Soft-wooded plants will require free ventilation, subject to the preceding remarks, as the more forward of the Show and Fancy Pelargoniums, Calceolarias, &c., will be advancing rapidly into bloom, and a free admission of air is necessary to give strength to the plants and colour to the flowers. Attend to them regularly with water, giving a little weak liquidmanure occasionally, say once a week, and guard against insects. Pelargoniums for late blooming must be stopped. and attended to, as must also Calceolarias. No plants can be more useful for very early and very late blooming than Fancy Pelargoniums, as if they are of sufficient age and size it is almost impossible to keep them from blooming even in the depth of winter. Growing Azaleas must be encouraged with a little heat and plenty of moisture; and Camellias for early blooming next season will require much the same treatment.

Cold pits and frames will be filled with young stock for the flower-garden, which must be attended to to get it strong. Stocks, Mignonette, Calceolarias, and old Verbenas, may be put into temporary frames, and protected with mats, so as to give room for the young plants now ready to be potted off from the propagating pit. As the plants get established, harden them off so that they may be ready to plant out the middle of May, or sooner in sheltered situations, for if the plants are properly prepared a slight frost will not injure them,

Continue to propagate all plants of which a large stock is required, and pot off such at the present time in the propagating pit as are in a fit state. When you have room, a lot of Chrysanthemum cuttings must be got in; but it is better to strike late, and grow the plants properly afterwards, than to strike early, and to allow the young plants to get into a stunted state afterwards.

In the Forcing Garden the Cucumbers will soon be coming into bearing, and the Melons must be ridged out without delay, observing to give them good loamy soil, but avoiding manure for all kinds. Sow Basil, Marjoram, and other sweet herbs, also some Tomatoes and Capsicums, and nurse them to get them strong. Sow also Cucumbers for ridges, and Vegetable Marrow towards the end of the month.

If the main crops in the Kitchen Garden have not been got in, and the wall trees are not all nailed, no time must be lost in getting them in. Sow successional crops of Peas, Beans, Lettuces, Spinach, Turnips, Radishes, Walcheren Cauliflower, and Small Salading as often as necessary. Sow also French and Runner Beans, a full crop of Brocolies, Brussels Sprouts, Savoys, Borecole and Cabbage in the first week, and protect the seed from birds. Plant out successional crops of Cauliflowers, Lettuce, Cabbage, &c. Hoe and stir the ground among growing crops, destroy insects, and keep everything clean and neat.—P.

## ON THE CONSTRUCTION AND USES OF HYGROMETERS.

By E. J. LOWE, Esq., F.R.A.S., &c.

77ARIOUS have been the instruments which philosophers have invented for ascertaining the hygrometrical state of the atmosphere. Catgut, wood, the beard of the wild oat, &c., were formerly used, but their hygrometrical properties vanished by constant exposure. De Saussure used the human hair, and De Luc a thin piece of transverse grain of whalebone; but where variation in length, volume, or weight is the mode of action, no dependence can be placed upon the instrument. Daniell's hygrometer, which is a very good one, has many disadvantages-requiring very careful manipulation,

and ether of the best quality. There is no instrument so good as a pair of good thermometers, the bulb of one being enclosed in thin muslin, to which is attached a piece of lamp cotton wick communicating with a vessel of rain water; these should be renewed once a month.

The conversion of liquids into elastic fluids is evaporation, and this goes on at all temperatures, from the hottest day in summer to the coldest night in winter; and if we only call thirty inches the annual amount evaporated from the surface of the waters of this globe (a quantity in all probability much below the average), water to the amount of 62,000 solid miles is each year changed into clouds, which clouds condense in their turn and form the copious showers which water the plants and supply the springs. When we consider the moist condition of the soil, an additional supply of evaporation must be added to make up the deficiency in this calculation. The process is carried on in the following manner:-The great oceans supply the air with moisture; the heat of the sun causing rapid evaporation, the aqueous particles are carried into the atmosphere in an invisible state until they approach a cold current, when they condense, and are visible as clouds, which float along until a further condensation precipitates them in the condition of rain, snow, or hail; these, when they fall on dry land, hasten along, accumulating rapidly, until the drops of rain form a stream, streamlets accumulate into rivers, and, at last, the drop is conveyed back to its parent, the ocean. The rivers all flow into the sea, carrying large volumes of water, yet the seas are never too full; and why? The oceans give back an equivalent, for evaporation is the cause, the making, of rivers, and is constantly going on to keep

them flowing. Springs of water owe their supply to the same cause, and are cold or warm according to the temperature of the different underground strata through which they happen to flow. A mountain stream, i. e., one originating on a high hill, is cold, whereas one whose reservoir is deep in the earth is warm; as for instance, the warm springs of Bath, or the still warmer ones of Iceland. Vapour is most

DRY AND WET BULB THERMOMETER. plentiful at the equator, becoming gradually less abundant as we near either pole; but in tropical countries it is held in an invisible state, whereas, in colder regions it is condensed into clouds.

The dry and wet bulb thermometer is a modification of Dr. Mason's hygrometer. The latter has a glass fountain for the supply of water, which is easily broken by frost, whilst the common dry and wet ball thermometer is furnished with a zine cup, having a lid with a hole in the centre for the cotton conductor to pass through; the cup is situated away from the dry ball, and its surface covered, in order that the evaporation from the water may not influence its readings. The bulb, which is covered by muslin, and moistened by means of the water conveyed by capillary action up the cotton wick, will show a temperature depending upon the following circumstances: " The air in contact with the wet bulb gives enough of heat to vaporize the water, which being converted into vapour sufficient in quantity to saturate the space which the air occupies, the reduction of temperature will be according to the quantity of heat which has been combined in order to change its state from water to vapour." The difference indicated by the dry and by the wet bulb thermometer is occasionally (between April and September), 18', and frequently from 9' to 12'; in other months, seldom more than 9', and more fre-



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quently 4°; and in the depth of winter 1° to 2°. The temperature of the dew point, which is deduced from the readings of the dry and wet bulb thermometers, is occasionally 30° below the temperature of the dry bulb thermometer, frequently in summer 20°, and between September and April, 6° to 15°. When the pressure of the air is recorded (by a good barometer), at the same time with the readings of the dry and wet bulb thermometers, a number of useful and interesting particulars may be calculated. As an example, let us take the observations made at the observatory, Highfield House, during the quarter ending June 30th, 1850; the mean pressure by the barometer was 29·726 inches; mean temperature by dry bulb thermometer 52·8°; mean temperature by wet bulb thermometer 49°. From these we learn that the mean temperature of the dew point was 45·5°; the mean weight of vapour in a cubic foot of air was 3·7 grains; the mean additional weight required to saturate a cubic foot of air was 1 grain; the mean degree of humidity was 0·789 (1·000 = complete saturation), the mean whole amount of water in a vertical column of the atmosphere was 4·5 grains; the mean weight of a cubic foot of air was 532 grains; the mean pressure of dry air was (reduced to the sea level), 29·518 inches, and the mean elastic force of vapour (or pressure of water in the atmosphere), was 0·327 inch.

The use of the dry and wet bulb thermometer to the hothouse gardener is twofold; first, as a weatherguide; and second, as a means of regulating an artificial climate to such plants as cannot enjoy themselves except under certain peculiar conditions. With respect to a weather-guide, take the example given by Mr. Glaisher. The dry bulb thermometer being 70°, and the wet bulb thermometer 55°, before moisture could be precipitated, the temperature must fall 15° (in which case the precipitation would most likely be mist or small rain); or the dew point must rise  $22.5^{\circ}$ ; or the quantity of aqueous vapour in a cubic foot of air must increase from 3.76 grains to 8 grains, (in which case the rain would be heavy); or the temperature of the air must fall at the same time as the dew point rises, and some conjecture may be formed of the probable duration and kind of precipitation, according as one or the other of these last-mentioned causes prevail. Without a dry and wet bulb thermometer, many valuable plants have been lost, although the precaution is so easily accomplished. All that is necessary is to learn the mean temperature of the air, and the mean degree of humidity of the climate from whence the plants have been brought. Suppose the temperature to be 70°, and the dew point 50·5°: provide a water tank, furnished with a moveable cover, so that a greater or less body of surface water may be exposed as circumstances require; heat your stove up to 70°, and give out as much moisture as will bring down the wet bulb to 57°, and you have then produced an atmosphere in which the plants will flourish.

#### POMEGRANATES OF BELOOCHISTAN.\*

MHE Date is the characteristic fruit. It does not grow above 5,000 feet, for it cannot stand the A snow and rain of the upper region, "Caloris avida est, et frigidum ferre nequit." A station in the Bolan is called Sir-i-Khujoor, from being the limit of the Date in that direction; it is about 4,500 feet above the sea. It does not grow at Quetta or Candahar, or indeed anywhere, except it can get a hot dry atmosphere. The Pomegranate is a more accommodating plant, for it produces good fruit under very different climates; and cuttings from a superior kind of Pomegranate, would probably produce good fruit in most parts of the sub-tropical zone. It does not seem to succeed in the tropics; but, perhaps the only eatable variety, that with abundant red pulp and soft seed, free from grittiness, has never been introduced. The Pomegranates of Jellalabad are proverbially excellent, in latitude 34° 25', at a height of 2,000 feet below the snow region: and in the lower region, as denoted by the Calotropis procera, Rhazya stricta, Ærua lanata, and Zizyphus Jujuba. Equally good are the Pomegranates of Kirani, near Quetta, at a height of 5,700 feet, in latitude 30°, where snow is plentiful, and the winter very severe. The Pomegranate grows both at Kabul and Kelat, but its fruit is not esteemed. It is said that there are first-rate Pomegranates, red-seeded and pulpy, at Jodpoor, in Marwar, in latitude 26°, at the edge of the Great and Little Deserts, in a sandy soil, whose characteristic plant is Acacia arabica; and it is well known that the Pomegranates of Mekran, and of the hot countries bordering the Persian Gulf, are first-rate in quality. Very excellent, also, are the red Pomegranates of Khozdar, in Beloochistan, in 28°, at a height of 4,000 feet, and just out of the upper or snow region. The disparity in climates between Kirani, near Quetta, and the hot countries bordering the Persian Gulf, must be great indeed; for vast is the difference between Kirani and Khozdar, or Kirani and Jellalabad, or Kirani and Jodpoor, or Kirani and Mekran; yet in all grows the Pomegranate called Bédána, or seedless, with abundant red pulp, and seeds free from grittiness.— Dr. Stocks.

\* Hooker's Journal of Botany.

## THE SCIENTIFIC HISTORY OF A PLANT.

By John M. ASHLEY, Esq., Lecturer on Chemistry to the Hunterian School of Medicine. (A lecture delivered before the royal medico-botanical society of london.)

To the request of my friend, the learned Professor of Chemistry to this society, I have been induced to throw together, into a connected form, a few facts, tending to show how the sciences of chemistry, geology, and meteorology are, by means of botanical geography and structural botany, connection that exists between the sciences of chemistry, geology, botany, and meteorology between the sciences of chemistry, geology, botany, and meteorology. But a subject as this, considering how very limited my knowledge must necessarily diminished when I found that this grouping of the sciences led me within the portals of a new science, which is founded upon more enlarged generalisations than any other that has gone before it, and this because it is the last product of the rearing and creative faculty applied to a reviewal of the more extended surveys of the natural world which we have now, coupled with the accurate and profound knowledge of the labours and advances of philosophers during past years.

Natural history geography is the science to which I allude: a science which, besides geogra-Natural history geo. phical description, includes the general phenomena of the present life of the globe, in reference to their connection and mutual dependence. For the most part, this science is a production of the German schools. Schlegel, in his "Concordia," in 1820, put forth some of the germs of this branch of natural philosophy (or rather this combination of branches); in seven years afterwards, in 1827, appeared those memorable lectures on the "Philosophy of Life," embodying more extended and perfect views than had yet been suggested, even although, as early as 1806, and perhaps before, some of the sketches which at present form the "Aspects of Nature" were publicly delivered by their illustrious author. At the end of the fourth lecture on the "Philosophy of Quotation from the Life," we find expressed one of those truths to which I have just alluded :- "An lectures on the Philoso exalted view and understanding of nature consists in its being contemplated not phy of Life, p. 91. merely as a dynamical play of reciprocal forces, but historically in its course of development, as a commencing life, perpetually relapsing into death, ever disposed to sleep, and only painfully raising itself, or rather raised and lovingly guided through all the intermediate grades into life. But beneath the huge tombstone of outward nature there sleeps a soul not wholly alien, but half akin to ourselves, which is distracted between the troubled and painful reminiscences of eternal death, out of which it issued, and the flowers of light, which are scattered here and there on this dark earth as so many lively suggesters of a heavenly hope." Perhaps in a more eminent degree, Carl Ritter Carl Ritter, Schlegel, aided in forwarding the science of natural history geography. He, as well as Schlegel, recognised the vitality of the globe. Our views on this subject have to a considerable degree been enlarged and strengthened by the translation into English of the beautiful comparative physical geography of Arnold Guoyot—a work that cannot be too extensively read. But after all, there is one name which is more especially associated with this science—a name which has been by Professor E. Forbes termed its organizer, as well as originator: I allude to the Baron Alexander Von Humboldt.

Natural history geography may be regarded as including, among other things, the different cheminal Natural history geography may be regarded as including, among other things, the different cheminal Natural history geography a group of seisor of plants and animals—of plants, because the conditions of a thriving vegetation are so various that under certain circumstances there springs a peculiar flora, giving a characteristic scenery to a country, and so influencing the mind. But such a distribution is also an index to the geology, because certain plants require a certain soil, and the quality of the soil depends mainly upon the geological formations; to the meteorology, because certain plants require particular amounts of heat and moisture. It is the proper province of chemistry to tell us the constitution of the soil—to show what ingredients are contained in a plant from the analysis of its ashes: so that chemistry geology, and meteorology are, by means of vegetation, brought into a more intimate relationship. We can, however, look at a plant as the theatre for the display of certain physical actions—as an apparatus Physical actions of a constructed for exhibiting certain purely molecular actions—endosmose, exosmose, plant.

Plant constructed for exhibiting certain purely molecular actions—endosmose, exosmose, capillary attraction, force of suction—so that general physics may be added to the other group. Under all these circumstances, therefore, the subject appeared not inapt to bring before the members of a society connected as this is with the study of botany.

In reference to the first portion of our subject—the chemical phenomena of vegetation. I may observe, that we are much indebted to the researches of Professor Liebig; and the benefits he has conferred upon science are very great, for this reason: they are two-

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fold in their nature. Besides the actual results of his own labours—and they are many and various—he opened a new field for the direction of the energies of other men. Were his theories all wrong—his researches all false—still, if by them the spirit of inquiry was aroused, in the end he would benefit science. The past history of inductive science confirms this statement. We cannot now afford time to trace the origin and rise of agricultural chemistry, but must be content with a slight glance at it as it now exists—a product of the mental exertions of the German professor.

The first point of importance upon looking at the chemical phenomena of vegetation, is, that there The chemical and physe are various actions always going on in a plant owing to the decomposition of certain scalar actions of a plant. Portions of its structure, or of the materials whence it derives its food—actions extremely different to those mechanical actions to which I have before alluded. They are changes which at first sight appear to be strictly chemical, and which are very often confounded with each other. I refer to the decomposition of carbonic acid and of water—to the absorption of oxygen during darkness—to the emission of carbonic acid during the night. The decomposition of carbonic acid and of water may be designated as chemico-physical action; the absorption of oxygen during the night is entirely a chemical process; the emission of carbonic acid being, on the other hand, a purely mechanical operation.

For the decomposition of carbonic acid and water, we find that light is required; that where there Action of light upon is a deficiency of light this action goes on but partially. Researches have proved that while the blue rays are most active in germination, the yellow rays act more readily on the developed plant. Mr. Robert Hunt, in a lecture which he delivered at the Royal Institution last year, on "Light and Actinism," stated some valuable and curious facts. He considers germina—Mr. Robert Hunt on tion to be entirely dependent upon the actinic, but to be actually impeded by the actinism and vegetation. luminous, rays; while, on the other hand, this decomposition of carbonic acid, this lignification is most extensively carried on by the action of the luminous power, and is stopped by the actinic force. As summer advances, the thermic and the parathermic rays are most conducive both to fruiting and flowering. All that we can say to these carefully investigated and well proved facts, is, that they give us one of the most striking examples of the adaptation of inorganic nature to organic life that can be found in the whole range of physical science.

From the first moment of the germination of a seed, carbonic acid is always being absorbed, but not Nightly absorption and always, as I have before mentioned, being decomposed; for in the dark this action is stopped, but the carbonic acid still continues to be absorbed by the juices which the plant holds in solution. This action was very aptly compared by Professor Liebig—this emission of water and carbonic acid from a plant in the dark—"to a cotton wick enclosed in a lamp containing a liquid saturated with carbonic acid." Water and carbonic acid are taken up the wick by capillary attraction, both evaporating on its exterior surface. In the night another action goes on in the growth of plants—the absorption of oxygen; an action as purely chemical, as the evolution of carbonic acid was purely mechanical. Yet, because they occur simultaneously, it was presumed that they were subject to the like causes; even after it was found out that their ratios of action were not equal; for plants absorb more oxygen than they emit carbonic acid.

This nightly absorption of carbonic acid is, to a certain extent, independent of the life of the plant, various results of the not acting upon the main parts, but upon the blossoms, fruit, and leaves, and the nightly absorption of result of experiment has revealed to us the facts, that leaves containing highly nitrogenised compounds, or volatile oils, absorb oxygen more vigorously than leaves which contain neither of these principles. In the latter class of leaves the volatile oil, by the action of oxygen, is converted into a resin. The Agave americana, absorbs 0·3 times its volume of oxygen in twenty-four hours; the Pinus Abies, containing volatile and resinous oils, ten times its volume of oxygen; and the Populus alba, twenty-one times its volume of oxygen during a day and a night.

I need hardly mention as a familiar example of these chemical changes, caused by the absorption of Cacalia ficoides. oxygen, the Cacalia ficoides, which is sour in the morning, tasteless at noon, and bitter in the evening from the excess of hydrogen; it became tasteless when there was no excess of oxygen, and sour owing to the oxygen which it had absorbed during the night.

This decomposition of carbonic acid is most interesting to us as exhibiting clearly the real process correct theory of hu— of lignification; as helping to establish correct notions regarding that vegetable matter undergoing eremacausis which is familiary known as humus; experiments have proved the insolubility of humus; calculations have demonstrated, that suppose there existed a superabundance of the most soluble salt of humic acid, still all the carbon which it might contain,

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would be totally inadequate to give us but a very small portion of that carbon which is found in vegetation. But another calculation was made as to a different source for the carbonic acid; a calcucarbonic acid supplied lation which was based upon De Saussure's accurate determination of the amount of by the atmosphere. carbonic acid present in the atmosphere, an amount of a little more than one-thousandth of its weight; yet we find that the air contains a no less sum than 3085 billions of pounds of carbon, a quantity surpassing in weight not only the carbon of existing vegetation, but also that which is at present locked up in the mineral coal which is distributed over certain parts of the earth's surface.

It may now well be asked. How lives the young plant before it comes in contact with the atmochemical action of a sphere, the source of its carbonic acid? The reply to this question is the key to the proper action of humus. This humus is especially useful for the support of young plants; it takes oxygen from the air, and then furnishes the plant with carbonic acid—this is its great use. We see, then, that the process of nourishment in a young plant totally differs from those actions by which the well developed vegetable is supported. A young plant causes a certain quantity of oxygen to be abstracted from the atmosphere, while an old one furnishes us with a never-failing source of this gas.

I cannot help referring to the fact, that many juicy and milky plants, in warm countries, flourish on Certain shrubs grow a soil destitute of humus, containing absolutely not a trace of carbon; and sometimes are found being held by one point of attachment to this barren soil—such shrubs as the Cactus and the Caoutchouc are among this number. Baron Humboldt especially mentions the Caetus tribe. In his beautiful paper on the "Physiognomy of Plants," he states:--"In the waterless plains of South America, animals suffering from thirst seek the Melon-Cactus, a spherical plant half-Humboldt on the Cac- buried in the dry sand, and encased in formidable prickles, but of which the interior abounds in refreshing juice. The stems of the columnar Cactus often rise to the height of from thirty to thirty-two feet; they are often covered with lichens, and dividing into cande-Aspects of Nature, vol. labra-like handles, resemble in physiognomy some of the Euphorbias of Africa." Again, in note 20:- "When one has been accustomed to see Cactuses only in our hot-houses, one is astonished at the degree of density and hardness which the ligneous fibres attain in old Caetus stems. The Indians know the Caetus wood is incorruptible and excellent for bars and the thresholds of doors. There is hardly anything in vegetable physiognomy that makes so irregular and ineffaceable an impression upon a newly arrived person, as the sight of an arid plain thickly covered, like those near Cumana, New Barcelona, and Cora, with columnar and candelabra-like divided Cactus

We must all allow, that this fact of the growth of highly ligneous plants containing juices in Facts opposed to the old theory of humus. arid plains, is not in favour of an hypothesis that considers vegetable mould as the true source of carbon for plants.

Besides the property of decomposing carbonic acid, vegetables have also the power of decomposing Decomposition of water: hence the source of hydrogen. At first sight we must imagine that there by plants.

must be a marvellous energy in the chemical process of vegetation when able to effect what the electricity of a powerful thunderstorm accomplishes only feebly and imperfectly: but when we reflect upon the various methods by which water can be decomposed, this feeling is some
Assimilation of hywhat limited. The metals—some at common temperature, others at a red heat, and the same, or more of them in contact with a strong acid; and, as it has been beautifully shown by Mr. Grove, by heat alone.

We know that this action must take place, from the fact that caoutchoue, wax, and oils, contain more hydrogen than oxygen; and we also know that water must be the only source of the hydrogen.

Action of hydrogen The water is decomposed, the hydrogen is taken up into a plant with the green principle of the leaf, which diminishes in quantity when oxygen is absorbed. Plants containing water and carbonic acid and evolving only a little oxygen, give an acid,—evolving more oxygen, they form a neutral substance,—evolving a large amount of oxygen they give us an oil.

Again, chemical analysis pointed out *nitrogen* as a constituent of plants, and for a long time it was Nitrogen aconstituent of plants given to them shown that it has its origin in the *ammonia* which is always found in the atmosphere.

It was found that plants would grow in charcoal, or in calcined earth containing not a trace of carbon, if watered with rain water, and this because rain water contains more ammonia—hence its softness. So there are two forms in which this ammonia, so requisite for vegetation, may be found: as a gas existing in the atmosphere (though this is seldom the case), and held in solution by water which

conveys it to the soil. Agriculturists find that the form in which it is given is of more importance than the actual quantity. Carbonate of ammonia is often found in large quantities; but it is a volatile salt, and for this reason a very considerable quantity of the ammonia it contains is volatilized and lost. The object of gypsum as a manure is to produce that double decomposition by which is formed carbonate of lime and sulphate of ammonia, a more stable compound.

The source of ammonia exhibits to us one of those beautiful and never-ending cycles of mutual Sources of ammonia. relationship upon which the mind of the real observer of nature always delights to dwell. Throughout the physical world, from its first formation to the present time, there has never ceased to go on a perpetual mutation of matter-a ceaseless, ever-restless desire for change of form, and after some boundless wanderings, a turning back again, to undergo perchance the same work, though on a different subject—at a great distance from its former one—and after an inconceivably long interval had elapsed.

"Communion with nature awakens thoughts that had long lain dormant," enthusiastically exclaims Indestructibility of the author of the "Cosmos." Surely this sentiment must find within a hearty echo, when for the first time we contemplate—actually by experimental demonstration the imperishability and the indestructibility of matter: when, as in the case of the combustion of an organic substance with oxide of copper, the sugar, the volatile oil is destroyed, but its elements have assumed new forms, rendered cognizant to the senses by the balance.

It is this great fact which lends to my mind a charm—somewhat fanciful, I must admit—for the Transformations and science of geology. The thought that the oxygen—as carbonic acid was emitted so plentifully in the volcanic disturbances of the ancient world-which formed part of its atmosphere then passed into the composition of the flora of the gigantic vegetation of the coal-fields—the liberated oxygen in after ages uniting itself perhaps with a mineral, forming a sulphate—again to be reduced by organic matter to a sulphide—the carbonic acid freed again, passing off into oxygen by the vegetation of the oolite-taken up into the systems of the iethyosaurus-that this same oxygen, for what we know to the contrary, may even now be helping to carry on in us the vital process—is still at work to change again—to become as pure and free as it ever was, and not different from ourselves,-never to wear out or to decay, but while the world lasts to be pursuing a destiny predetermined before its existence by the Great Author of nature.

Ammonia is secreted from the body during life: it is a result of its putrefaction when dead. A Ammonia: its sources thousand million of the human race, besides animals, annually die. How much nitrogen is thus given to plants is a question that I think it is beyond the limit of science to answer. But it comes round to us again, though not exactly in the same form; for the plants supply the herbivora, who in their turn supply the carnivora. In some recent researches, I obtained from several Ammonia: a product coffins a nitrogenized compound called adipocere, rich in ammonia -- in fact, an of putrefaction. ammoniacal soap. In all cases, on opening a coffin, there was a powerful odour of ammonia; and as an illustration of the large amount of it in this adipocere, I may mention, that happening to have some in my pocket, on standing before a fire it began to melt; some ladies at the same time observing, "What a very strong odour of hartshorn there is!"

If all four can be represented by an oval, as some suppose—ab ova omnia—somewhat on the same principle, the actions of nature might be represented by a circle. The excrement of plants afford another example of circular change. Besides those which are gaseous and solid, there are some liquid excrements which are excreted by the roots and absorbed by the soil: these fluids are very rich in carbon, so that the amount of that element which is furnished to the young plant by the humus is actually, by the secretions of the grown vegetable, returned again to it.

But the greatest of all these circular changes is that which subsists between the animal and veget-Balance between the able kingdoms-the principles of the two systems of life requiring the refuse, the one animal and vegetable of the other. It would be altogether out of place here to mention any statistics as to the large amount of carbonic acid derived from artificial combustion, from thermal springs, from extinct volcanoes, or from the respiration of animals; but we know that if it were not removed the atmosphere could not for any length of time support life. But vegetation does this great work, and cultivation in most cases produces a purer atmosphere; so these plants serve the animal kingdom in two ways-by supplying it with food, and by affording it a pure atmosphere.

I can hardly conclude this sketch without making some reference to the origin of vegetable life, a subject which it is well to be cautious in approaching, because of the present An hypothesis proimperfect state of our knowledge. Among the many theories of life (so, I suppose, darily for vegetable life. they must be termed), although we cannot even attempt to reach ultimate causation,

I may perhaps be allowed to express what may be termed a fancy of vegetable life (for theory is far

too grave a term to be applied here)—a fancy of vegetable life founded upon a review of Dr. Faraday's magnificent discoveries.

The vitality of a plant forms an episode in the history of discovery, because at the first animal life was regarded as totally distinct from vegetable life; but as facts accumulated, analogy in functional arrangement, though brought about by a different form of organic apparatus, leads us to suppose that there was but one known cause of vitality, both in plants and animals. In a plant, heat and light are considered as necessary, but not as the first great moving power. Vegetable physiology advances, and seems to incline to the idea that the vitality of a plant is a purely chemical process.

Upon what is dependent, then, this chemical action that enables a plant to decompose both carbonic vitality of a plant considered as resulting from inherent magnetism.

acid and water, that is always going on in it as a part of its life, and the source of its development? The magnetic discoveries of Dr. Faraday of the connection between magnetism, light, and crystallisation, have no doubt brought us to the eve of a great generalisation. We are in a state so happily described by Humboldt as "a state of presagement"—in one of those intervals that renders the history of philosophy so indistinct between the presentiment of an epoch and its actual realisation. We have the strongest grounds for considering galvanism, electricity, magnetism, as one and the same force; which force is a certain quality of matter termed by Professor Graham polarity, which is due to the presence of inherent magnetism. So then, we may almost go so far as to say, that the same force that deflects a ray of polarised light—that causes the crystal to elect a certain determinate position in the magnetic field—that gives polarity to the needle of Generalisation upon the compass—that this same force causes the formation and growth of an organic cell.

Such may be considered as an unfinished and imperfect glance at some of the most striking points in the chemical history of vegetation; but our survey is not yet finished. The vegetable flame requires the introduction of certain peculiar elements which are not organic, but which nevertheless it makes subservient for the support of life, and for the growth of structure.

We do not now wish to discuss the exact degree of alkalies or alkaline earths required in certain required of soil are required for different plants. We know that Oaks require certain conditions for their existence; in some soils they flourish, in others they will not live. A barren and granitic soil amply supports the Pine and the Fir, but not the Oak; and this because such soils do not contain sufficient alkalies for the purpose. The Equisetaceee, like the Oak, require much potash; a soil formed from the grauwacke, and porphyry nourishes these plants.

The Tobacco-plant and the Vine require lime; the Beet and Potatoes magnesia; Chenopodium likes nitrates; and the Fuchsia iodine; Cereals phosphates of ammonia and magnesia. For the growth of these plants, one or other of these constituents is required; but there are some soils composed of pure sand and limestone—they support no species of vegetation; they are absolutely barren. Argillaceous earths always exist in a fertile soil; their fertility being doubtlessly derived from the alkali they contain, because rich soils were formed by the disintegration of potash and soda felspars. Alumina is never found in the ashes of plants; its action is merely indirect. It is useful in condensing the water and the ammonia of the atmosphere. A cubic foot of felspar contains enough potash to supply an Oak-copse of twenty-six square feet with potash for five years.

We find, even in short excursions in our own country, great changes in the scenery of different places; this is often brought about by the predominance of a certain class of shrubs. We may pass a woody country—a country occupied as arable land—an entirely pastoral country. Whence this difference? From the soil, which influences the productions owing to the operations in nature of the facts which I have just stated. Soil, with climate, is omnipotent in influencing the distribution of plants; and the formation of soil and arable land is one of the main points of agricultural geology. Such a fact furnishes us with a very clear example of the connection existing between chemistry, botany, and geology.

But how are soils formed? This is yet a question to be explained.

In speaking of the imperishability of matter I alluded to the changes which it is constantly undergoing, because the earth, from the first moment of creation, has been subject to the never-ending play of natural forces; and by looking at the present state of the globe, and then by reading its past history, the mutation of all material substance is thoroughly illustrated.

The progress of disintegration has not been much investigated; but Liebig has collected into his Disintegration has not "Agricultural Chemistry" the results of most experiments on this subject. He been much investigated divides the process of disintegration into two groups—waste, the result of mechanical force, and disintegration, properly so called, a product of chemical action. It by no means follows that

both disintegration and waste may not be simultaneously taking place in the same rock, or in other words, both chemical and mechanical causes operating in unison, and by their union producing great effects.

The action of carbonic acid and water is generally to liberate in a soluble form the alkaline bases,

Action of carbonic producing frequently as an ultimate product hydrate of silica, before which is often formed a soluble silicate. I presume that a descriptive detail of the properties of silicic acid would be superfluous; but an experiment of that talented chemist, Lavoisier, deserves notice here.

Silicates are more or less decomposed by the action of hot water; the opacity of the windows in Lavoisier's experiment. hotbeds is an example of this. Lavoisier, on distilling some water from a clean glass vessel, found that it left a residue; on weighing it, he also found that the glass retort had lost in weight what the water had gained: from this experiment, it was obvious that a portion of the silica of the glass had been dissolved during the distillation.

It is needless to enumerate all the substances upon which chemists have operated; suffice it to say that their experiments have had a very extended range, and that they confirm all the statements made by those who preceded them in this investigation. In this memoir there are two points of especial interest.

Alkalies not so important in disintegration as formerly believed.

One is, that the alkalies are not quite so essential to the disintegration and decomposition of mere rocks as it was at first supposed: for hornblende, epitote, chlorite, and rocks composed mainly of these substances, underwent rapid decomposition by pure as well as by carbonated water, and this without calling in the agency of an alkali; this

experiment accounts for the fact that rocks of this kind are often more readily decomposed by meteoric agencies than are felspars: it enables us to trace the simple process by which plants are furnished with the lime and the magnesia they require, without our having recomposer to any mysterious decomposing power of the roots of the growing vegetable. The second and most important result is, that potash,

Potash, soda, and their carbonates, but especially carbonate of potash, is volatile at a red carbonates volatile at a heat,—that many plants contain much alkali, whereby a very little is found in the ashes after incineration. So, by this incineration of the ashes of a plant, according

to the ordinary rules for the analysis of vegetables, the Professors Rogers' statements show that a very large amount of error must not only have been by such analyses introduced, but by them perpetuated. The ashes of anthracite, of bituminous coal, of lignite, contain not a trace of alkali, but digestion with water previously to incineration reveals to us their presence—thus adding another proof to the vegetable origin of coal.

I have not gone into the minutiæ of any actual decompositions which take place during the disintegration of certain rocks, because my object is more to point out a train of thought than to dwell upon the facts by which these reflections may be produced. Our facts may be likened to the landmarks of the journey, but their attainment is not its ultimate aim.

Having mentioned that certain plants require soils containing some particular mineral constituent, soils influence distribution of plants. and that for the most part soils are formed by the disintegration of the parent-rock of the district, it is obvious that these facts, when applied on a great scale to nature, must divide and influence vegetation; for according to the geological conformations of a country is its soil, and so is its flora.

The subsoil is generally in connection with the original rock, by whose wearing away it was formed, and the soil is in intermediate relation to it, not always having even the same colour; for it may be a transplanted soil, or separated from the parent rock by a larger amount of gravel, in which case the white subsoil from the chalk, or the yellow from the clays, would colour, depth, and ferror not represent the colour of the land's exterior surface. The depth, texture, and fertility of a soil is dependent both upon the mineral constituents and the easily disintegrating properties of the rock whence it is formed; and it is the physical and mineral, more than the geological age of a soil, that conduces to its fertility: old rocks may be barren in one place, but fertile in another.

Geological systems. I think that a glance at the average soils afforded by the different geological formations of this country, would tend to illustrate these remarks.

Passing over the Silurian System, upper and lower, including the Ludlow, Wenlock, Caradoc, and soil of the Silurian Llandilo formations, which have been so admirably classified by Sir Roderick system Murchison, a system which is largely developed in South Wales, Gloucestershire, Worcestershire, Shropshire, and Herefordshire, we arrive at a main deposit, the "old red sandstone," a most popular and beautiful description of the fishes of which has been given to us by Mr. Hugh Miller, in his work on this formation. When argillaceous beds alternate with layers of the sandstone,

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as is the case in the luxuriant orchards of Herefordshire, there is much fertility. The pure formation is very barren—the summits of its mountains being covered with snow.

The Carboniferous System, including the mountain limestone and the millstone-grit, does not form a soil of the carbonife good agricultural soil; millstone-grit is usually at the surface of barren elevated moorlands, covered with mountain peat: here mosses flourish well on these elevated moors: it may be that the millstone-grit affords a congenial soil for them.

The mountainous limestone soil is, generally speaking, in an unimproved condition; yet the debris mineral contents. in some cases produces good pasture land. On the whole we cannot complain of the carboniferous system—even if its agricultural character is not so very valuable—when its annual mineral wealth is estimated at more than £19,520,000 pounds sterling.

The New Red Sandstone, upper and lower, is most bountiful to us: its mineral contents being rock soil of the new red salt, gypsum, heavy spar, and copper; and, with all this, it furnishes us with the richest land in England—fertile for wheat and beans, and producing very fine cider.

In the *Lias*, and its shales, marls, clays, rocks, we have much agricultural diversity—from the cold soil of the lias. Wet tenacious soil, which is produced from the blue clay, to the vigorous fertile land composed of clayey loam. In the upper part of the lias, where the sands of the inferior oolite rest upon it, they may be sometimes turned in and mixed with advantage. The lias forms extensive pasture lands in Somersetshire and Warwickshire.

To understand the very great diversity of soil which is found in the *Oolite* formation, we must take soils of the colite. into account its different divisions—its three primary, and eight sub-divisions. The soil of the upper colite is perhaps the most difficult to bring into a good state of cultivation, yet it affords some very beautiful woodland scenery in Oxfordshire and Northamptonshire.

The lower greensand beds of the Cretaceous formation, are very rich and capable of the highest soils of the cretaceous cultivation. The chalk downs, with their short sweet grass that feeds so many sheep, belong to the upper chalk; the lower beds of which, when mixed with alumina, are converted into a rich and valuable marl: the productive upper greensand gives this marl: in Bedfordshire the lower greensand is extremely rich.

In generally noticing the Tertiary beds, we do not make any distinction between the Eocene, Miocene, soils of the tertiary Phocene, and the Glacial period; including in them what does not rightly belong to them, the alluvium and the diluvium. We look upon this modern series as epitomised in the London and Hampshire veins—as partially also exhibited in Norfolk and Suffolk. In these beds we have clay, gravel, and sand. It is obvious that gravel must form a poor worthless soil, while clay forms a very cold one; yet, when these substances are intermixed, they produce valuable and fertile arable land. It must be quite apparent that all these soils are more or less influenced by the physical conformations of the country in which they are situated.

Just now I spoke of soils doing more than simply supplying certain inorganic constituents to plants. I refer to the fact that by so doing they did something else than influence the geographical distribution of their species, genera, and families.

In merely a geological survey of a soil we are apt to underestimate, if not to overlook, the important water largely influences geographical distribution of plants.

fact, which is played by water in vegetation. Yet, if we east our eyes over a hydrographic map of the world, we find certain rainless districts, destitute of water courses, and where the air is rarified to allow of the condensation of aqueous vapour. What do travellers tell us of the vegetation of a tract of country so circumstanced? Why, in this rainless desert let but a little spring of water rise, it generates fertility in the limited sphere of its operations; an oasis is produced; and that arid ocean of burning sand rejoices in one small island of vegetable life.

Water is one local cause of influencing the fertility of a soil, but there are various others, many Local causes influent physical actions in one place shifting the superficial detritus which covers the more stubborn rocks; and if we do not take circumstances like these into account, we shall be apt to consider that geology gives us more information than it really does; to form the idea, that with a geological map before us, it would be no trouble by its inspection accurately to ascertain the soil of any particular country.

The millstone-grit plains around Paris in a geological map of the district, would be similarly Example of one of coloured; yet each one of these plains has its own particular form of vegetation. Montmoreney is covered with corn fields; Sannois supports only a short sterile rod; Meudon is furnished with Spanish chestnut trees; the Aira flexuosa, the Melampyrum sylvaticum, the Pteris aquilina, all grow there. Only a minute's inspection clears up this seeming incongruity. We find, though no difference is pointed out by the map—for geologically speaking, there can be no

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distinction made: they are all millstone-grits—we find in the one case the millstone-grit is mixed with sand; in another case it is mixed with clay; and, in the third, it is alone and uncovered.

Thus far have we pursued our journey, and now it is time that we pause. I would hope that my sketch has been clearly followed, and that my design, imperfect as it is, has been strictly adhered to.

In following the chemical history of a plant, we saw how interwoven were a variety of subjects chemical history of with each other; we saw, too, that the plant itself is capable of reading to us many a lesson from the great book of nature, of bringing before us many of her beautiful operations; of exhibiting to us clearly and distinctly some fuller proofs of that design, and order, and harmony, so palpably manifested in this our universe.

So then man and nature can be viewed as two great forces here, the one progressive, and the other Man and nature. stationary, albeit though not still, yet both working out their proper ends in the universal scheme of that Great Designer, which it is past the feeble ken of man to penetrate.

Such subjects as these must make us feel with Emerson that "the destiny of organised nature is Emerson on the destiny of organised nature, amelioration, and who can tell its limits? It is for man to tame the chaos on every tiny of organised nature, side, while he lives to scatter the seeds of science and of song, that climate, corn, animals, men, may be milder, and that the germs of love and benefit may be multiplied."

#### HORTICULTURAL SOCIETY.

March 4th.—At this meeting the greatest novelties produced were two plants of the Sikkim Himalayan Rhododendrons, about which so much has been said within the last two or three years; but if the varieties to come are no better than those we have seen, few people will care to be troubled with them. The flowers are small and pale lemon-coloured, and the plants have a rusty and stunted appearance, anything but inviting. The plants were sent by Mr. Wells, gardener to E. Hussey, Esq., Lamberhurst. A much more beautiful plant was Rhododendron javanicum, deficient in colour, from Mr. Cole, gardener to H. Colyer, Esq., a remarkably handsome plant with one truss of flowers. Mr. Glendinning, of Chiswick, sent a species of Labichea, from Swan River, with yellow flowers, which promises to become a useful plant. Mr. Blake, gardener to J. H. Schroder, Esq., contributed a group of Orchids, among which Lycaste Skinneri was a very remarkable plant. With it was a nice plant of Phalænopsis grandiflora and Epidendrum odoratissimum. Mrs. Lawrence sent Trichopilia suavis, displaying much more colour than when shown last year, with Burlingtonia fragrans, Cymbidium Gibsonii, and the singular terrestrial Orchid, Ponthieva maculata. Mr. Loddiges produced Dendrobium nobile with remarkably large flowers, and the lovely-flowered Cymbidium eburneum. From the garden of the society came Lycaste plana, Dendrobium cucullatum, a good plant, and several kinds of Acacia, Cytisus, Epacris, and Polygala.

March 18th.—Though the productions brought before the society at this meeting were not very numerous, yet several things of remarkable excellence were presented. Among these the Orchids from the garden of S. Rucker, Jun., Esq., deserve special remark, as being, if possible, superior to what we generally see from that splendid establishment. The most remarkable plants were:—Dendrobium Cambridgeanum, with upwards of 100 expanded flowers studding the plant completely over; the lovely Cymbidium eburneum, with 18 of its ivory flowers; and with it a small specimen of the same thing, the flowers of which were tinged with pink, and the lip spotted with rose and blotched with yellow; two varieties of Lycaste Skinneri, one the ordinary pale kind, and the other with the lip spotted with purple and the petals of a rich purple colour. With these were sent a splendid spike of Dendrobium anosmum, and the lovely Burlingtonia fragrans. Of novelties, Messrs. Veitch sent Rhododendron jasminiflorum with one truss of its delicate flowers. Some dried vegetables of various kinds, such as Potatoes, Turnips, Carrots, Cabbage, Brussels Sprouts, Beans, dried by a peculiar process, and suitable for use in sea voyages, were sent by the patentee, from France; with them were some dried specimens of flowering plants, which were remarkable for the admirable manner in which the colour of the leaves and flowers had been retained. Of fruit, Mr. Butcher, gardener to W. Leaf, Esq., sent some Muscat of Alexandria Grapes, good for the season; and Mr. Bennet, gardener to John Smith, Esq., and Mr. Higgs, gardener to Joseph Barchard, Esq., two punnets of Keen's Seedling Strawberries. Mr. Jones, gardener to Sir John Guest, sent a Moscow Queen Pine. The plants from the garden of the society consisted of Azalea obtusa, and a rose-coloured species marked Fortune's No. 20; Forsythia viridissima, Epidendrum aurantiacum, Dendrobium nobile, and several varieties of Epacris, Erica, and Acacia.





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#### POLYGONUM VACCINIIFOLIUM.

Nat. Order .- POLYGONACEE.

Generic Character.—Polygonum, Linnæus.—Flowers perfect or by suppression polygamous. Perigone generally coloured, five-toothed, more rarely three- or four-toothed; segments sometimes unequal, mostly enlarged after the fertilization. Stamens five or eight, either opposite, singly, to the segments of the perigone, or in pairs to its inner series; very rarely four or nine; filaments awl-shaped; anthers ovate, didymous, versatile. Glands perigynous or more rarely hypogynous, alternate with the stamens, sometimes wanting. Ocary one-celled, compressed or three-sided; ovule solitary, orthotropous, arising from the base of the cell; styles two- or three-toothed, or almost wanting; stigmas capitate. Achenium lenticular or three-sided, enclosed in the perigone. Seed of the same form as the achenium, erect; embryo surrounding the angle of the farinaceous or horny albumen, antitropous, slightly curved; coty-

ledons incumbent and narrowly linear, or accumbent and broadly foliaceous, received into a furrow in the albumen, radicle rather long, superior.—Herbs growing all over the globe, rarer in the tropics, annual or perennial, sometimes half-shrubby, occasionally aquatic or twining; leaves alternate, stalked or sessile, quite entire or sinuate, sometimes crisped undulated, occasionally having pellucid dots, with rather loose membranous ochreæ; flowers spiked, racemose or panicled, sometimes sub-capitate, with bracts either like the ochreæ or funnel-shaped, tubular.—(Endlicher Gen. Plant. 1986.)

Polygonum vaccinhifolium, (Wallich) Meisner.—Cranberry-leaved Polygonum. Spikes sub-cylindrical, loose-flowered, flowers spreading, leaves shortly petiolate, ovate or elliptical, attenuated at both ends, smooth; stem creeping.

ESCRIPTION.—Stem shrubby, prostrate, very much branched; the branches are either short and nearly erect, or long and prostrate. Leaves ovate, attenuated at both ends, usually having a short acute point, the margin slightly revolute, glabrous, reticulated, with numerous slightly prominent nerves, particularly on the upper face, bright green above, sometimes tinged with red, pale beneath, shortly stalked. Stipules long, with numerous strong brown nerves, soon torn so deeply as to present the appearance of a tuft of long stiff hairs. Flowers rose-coloured, in rather long sub-cylindrical racemose spikes, which are usually simple, but sometimes slightly panicled, and grow on short branches rising three or four inches from the ground. The segments of the calyx are oval. Stamens eight; styles three, rather long, the pedicels jointed just below the flower. Fruit three-sided, the faces lanceolate, shining, and minutely granulate-punctate.—A. H.

HISTORY, &c.—A native of the mountains of Northern India, growing at a considerable elevation, in company with Polygonum Brunonis, and our native P. viviparum. According to Dr. Royle, these plants reach an elevation of 13,000 feet, being found between that height and 7,000 feet. The present species was raised in the garden of the Horticultural Society of London, in 1845, from seeds communicated by Captain William Munro; and has been thence extensively distributed. It flowers for some time in the autumn.

CULTURE.—A rock plant, and perfectly hardy in this country when planted in well drained situations. It should have a tolerably good soil, and be kept from the encroachments of more vigorous neighbours: under such circumstances, it becomes a very useful plant for planting on rockwork. It is propagated readily by cuttings of the moderately young shoots, or by the trailing branches, which root as they lie on the surface of the ground.—M.

#### BOTANICAL FRAGMENTS.

MHE second series of the Rhododendrons of Sikkim-Himalaya recently published by Reeve & Co., A introduces to us several remarkable and mostly very beautiful forms of this genus, of which Dr. Hooker, during his just terminated journeyings, has found no less than forty-three species inhabiting this elevated tract of Northern India. This second series or fasciculus contains figures of ten species; and is to be shortly followed by another. The plates before us, which are beautiful as works of art, and no doubt faithful botanical portraits, represent: -R. Aucklandii (t. 11), a bush with large leaves, and very large white veiny flowers, remarkable for the comparative shortness of their tube; R. Thompsoni (t. 12), a splendid crimson-flowered bush, with short broad blunt leaves; R. pendulum (t. 13), a small pendulous epiphyte, with small white flowers; R. pumilum (t. 14), a charming little alpine form, the least of the Sikkim Rhododendrons, with pretty pink bells elevated above the foliage; R. Hodgsoni (t. 15), a tree with very large broad blunt leaves, and close heads of pinkish rose-coloured flowers; R. lanatum (t. 16), a large shrub, with the leaves tawny beneath, and sulphur-coloured flowers spotted with crimson: R. glaucom (t. 17), a very pretty small shrub, with leaves glaucous beneath, and heads of moderate-sized rose-pink flowers; R. Maddeni (t. 18), a shrub with pointed leaves, ferruginous beneath, and large long-tubed lily-like pure white flowers; R. triflorum (t. 19), a small azalea-like shrub, with moderate-sized greenish-yellow flowers; R. setosum (t. 20), a much branched shrub of a

foot or so in length, with small foliage, and comparatively large but ragged-looking "red rose" blossoms. R. Thompsoni, Maddeni, and glaucum, are the gems of this series.

Sir W. J. Hooker refers the *Conoclinium ianthinum*, figured in our vol. i. (p. 185), to the genus Hebeclinium, to which, Mr. Henfrey at the page referred to, had noticed its affinity. Sir W. Hooker says it assuredly agrees better with Hebeclinium than with Conoclinium; and native specimens have long been in his herbarium, collected by Jurgensen and Linden, not from St. Catherine, Brazil, as stated by the Belgian cultivators, but from Mexico, near Vera Cruz and Xalapa. He proposes to call it *Hebeclinium ianthinum*. Generically the plant is very near true Eupatorium. It proves to be a dwarf free-blooming plant, more ornamental and manageable than had been supposed; and probably may be grown successfully with less heat than has been recommended for it.

The old Cœlogyne maculata has been re-christened *Pleione maculata* (*Paxt. Fl. Gard.* ii., t. 39). Dr. Lindley remarks:—" The spotted Pleione has long been known to botanists as a species belonging to that alpine group of so-called Cœlogynes, of which C. Wallichiana is the best known example. They certainly greatly resemble the genus Cœlogyne," to which many years since he had reduced them, "but differ in certain points to which we shall refer when we proceed to figure Pleione humilis, another

charming species of which Messrs. Veitch have obtained possession."

The Dilpasand, a kind of Vegetable Marrow, is the fruit of Citrullus fistulosus, a species recently described by Dr. Stocks (Hook. Journ. Bot. iii., 74). It is closely allied to the Colocynth, but, unlike that bitter drastic species, is a delicate article of food. It has stout diffuse fistulous stems, which are densely villous, with spreading hairs and viscid odorous glands when young; the leaves are cordate ovate, five-lobed; the fruit at first apple-shaped and hispid, finally quite smooth, much depressed at the base and apex, and of a light apple-green; the seeds are black. It is known in Scinde by the name of Mého; in the Punjaub, by Hindwana (the name of the Water-melon in Scinde); and, in the Deccan, by Dilpasand, or "Delicious"—a very appropriate name. In Scinde it is cultivated from April to September. The fruit is picked when about two-thirds grown, of the size and shape of a common turnip. It is pared, cut in quarters, the seeds extracted, well boiled in water and finally in a little milk, with salt, black pepper, and nutmeg. In England it might be cultivated like the Vegetable Marrow, which it much resembles in its qualities.

Facts seem to be telling against the aboriginality of Anacharis Alsinastrum, an aquatic recently added to our list of native plants. One of the least suspicious localities in which it had been found was the Whiteadder, in Berwickshire, where it was found by Dr. Johnson, who now writes as follows: -"For thirty years I have herborized in that part of the Whiteadder where the plant is now common. When first I found the Anacharis I could discover only two or three tufts of it: I could see no more of the plant anywhere near. Now, however, the place is actually full of it; last year they had to get iron rakes to clear it away, and cart-loads were drawn out. Now, I maintain that it was impossible the plant could have escaped notice had it been there. It is no pigmy-in fact it is a plant that attracts notice; its minute flowers whiten the surface of the water. It is to me quite plain that it is of recent introduction. My explanation is this: the plant had been introduced into the lake at Dunse Castle, with alien aquatics, for in the lake there are several foreigners; there it had multiplied itself until it took thick possession of some parts of the lake. Now, while they were paddling amongst this herbage, some small bits may have adhered to the plumage of the wild ducks and other aquatic birds, and by their means they have been carried to the Whiteadder, which is, as the crow flies, about two miles from Dunse Castle." Mr. Whittaker of Breadsall has also recently found the Anacharis in great abundance near Derby, in places where it has never previously been known to exist. Our own experience is quite in accordance with these facts and inferences, as we have already expressed (vol. ii., p. 40).

We are glad to learn that Sir W. J. Hooker's Icones Plantarum is now to be published regularly and monthly. This useful work, which has already extended to eight hundred plates, is devoted to the

illustration and description of new or little known plants from the author's herbarium.

In addition to the *Belgian Heliotropes*, named Triomphe and Souvenir de Liége, which are justly esteemed, there has been raised another variety of equal merit, the *H. Immortalité de Louise Marie*. The ordinary species, as every one knows, has the odour of the Vanilla; but this new variety has a perfume partaking of the fragrance of the Violet and the Wallflower. Its habit is densely globular, and it produces its flowers much more freely than any other variety. The leaves are small and roundish. The cymes circinal, always dichotomous. On the whole, the plant has a somewhat drooping aspect, similar to those the Romans placed on the graves of their dead. The flowers themselves are large; green at the centre—emblematical of hope, surrounded by a crown of gold—emblem of holiness; and the five rays of the border present the virginal whiteness of the celestial stars, with this peculiarity,

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that here the emanation, instead of illuminating space, embalms the sweetest of odours. This variety, which was raised from seed by M. Marchot, secretary to the Société des Conférences Horticole of Liége has been named "Immortalité de Louise Maric," in order that while being everywhere propagated and grown, it might recall the great loss which Belgium has lately experienced in the death of her queen.—La Belgique Horticole, 125.

## Nem and Rare Plants.

Dombeya Viburniflora, Bojer. Viburnum-flowered Dombeya (Bot. Mag., t. 4568).—Nat. Ord., Byttneriaceee § Dombeyeæ.—A small tree requiring stove accommodation. It forms, when it has space to do so, a bushy head of copious hairy branches, with large heart-shaped three-lobed leaves, covered with soft hairs. The flower stalks a span or more long, spring from the upper axils, and bear a close dichotomously divided corymb of small white flowers, which are not very attractive. From the Comorin Islands, near Madagasear. Introduced before 1850. Flowers in February. Royal Botanic Garden, Kew.

MEDINILIA JAVANENSIS, Blume. Javanese Medinilla (Bot. Mag., t. 4569).—Nat. Ord., Melastomacee § Melastomeæ.—A handsome evergreen stove shrub, erect, with four-sided branches, large sessile, elliptic ovate, pointed, entire, five-nerved leaves, dark green above, paler beneath. The flowers form small compact panicles, and are of a pale flesh colour, with dark purple anthers. From Java. Introduced in 1849. Flowers in winter. Messrs. Rollisson of Tooting.

Wahlenbergia Vincæflora, Decaisne. Vinca-flowered Wahlenbergia (Paxt. Fl. Gard., ii. 13).—Nat. Ord., Campanulaceæ § Lightfooteæ.—Syn. Campanula vincæflora, Ventenat.—A pretty half-hardy perennial herbaceous plant, succeeding well, treated as an annual, and blooming under good management in about six weeks after sowing. It is a dwarf slender branching plant, having long narrow toothed-edged leaves, and azure-coloured white-eyed five-lobed flowers, spread out to an inch and a half across, with a very shallow bell; the flowers are pale on the outside, bright blue inside, painted near the middle and at the base with a line of delicate white hairs. From New Holland. Introduced? Flowers in summer.

Passiflora Penduliflora, Bertoloni. Drooping-blossomed Passion-flower (Bot. Mag., t. 4565).—Nat. Ord., Passifloraceæ.—A curious free-growing stove climber, without hairs, the young branches striated, and bearing copious, curiously-shaped, short-stalked leaves, which are rounded, approaching to wedge-shaped at the base, truncate at the apex, and are more or less distinctly three-lobed, three-nerved, with a row of five or six glands on each side the midrib. The flowers are solitary or in pairs from the axils, pendulous, pale-yellow green, about two inches across, with a coronet of about a dozen short erect club-shaped deep-orange rays; the column of stamens is proportionally very long, and the anthers are green. From Jamaica. Introduced about 1848. Flowers in spring and summer. Royal Botanic Garden, Kew.

Veronica Andersonii of Gardens. Anderson's Veronica (Paxt. Fl. Gard., ii., t. 38).—Nat. Ord., Scrophulariaceæ § Rhinanthideæ.—A soft-wooded shrubby greenhouse plant of considerable beauty; a garden hybrid, raised from V. salicifolia, fertilized by V. speciosa, and exactly intermediate in its form, colour, and habit of growth. The leaves are oblong-lanceolate; the flowers come in thick tapering elongated spikes, opening purple and changing to white, so that when in perfection the spikes present the two colours in a remarkably striking manner. A garden hybrid, raised by J. Anderson, Esq., of Maryfield, near Edinburgh, in 1848. Flowers in autumn.

LIPPIA ARGYROPHYLLA, Schauer. Silvery-leaved Lippia.—Nat. Ord., Verbenacee.—A small sub-shrubby plant, with obtusely-tetragonal hairy branches, and opposite or ternate leaves, two to four inches long, of an oblong acuminate form, sharply serrated, with scabrous hairs above, and silky beneath. The flowers grow in little globular or oblong heads as large as a cherry; the corolla is white, becoming yellowish at the throat. The native country is not known, but it has been distinguished by Dr. Schauer among the plants cultivated in the Botanie Garden of Berlin.

LIPPIA ASPERRIMA, Chamisso. Roughest Lippia.—Nat. Ord., Verbenaceæ.—A perennial herbaceous species, with a creeping rhizome, and creet somewhat four-angled stems, growing to the length of two feet, having oblong-lanceolate, coarsely-toothed leaves, and sub-globose heads of yellow blossoms. Native of the humid prairies of Brazil. Cultivated in the Botanic Garden of St. Petersburg.

Deutzia Gracilis, Zuccarini (not of Gardens). Slender Deutzia (Part. Fl. Gard., ii. 7).—Nat. Ord., Philadelphacee.—A fine deciduous shrub, said to grow naturally five or six feet high. The branches are long, flexible, and drooping, especially when in flower. The leaves are small, wedge-shaped, lanceolate or ovate-lanceolate, seriated, covered with fine starry hairs. The lateral branchlets are terminated by graceful racemes of simple snow-white flowers, which are borne in profusion. The shrub is hardy. From Japan. Introduced by Dr. Von Siebold to Belgium. Flowers in spring. Mr. J. Baumann of Ghent.

Polygonew.—A pretty hardy herbaceous perennial, with erecping stems, rising upwards at the points, and there bearing narrow elongated somewhat interrupted spikes of small rose-coloured flowers, somewhat resembling the allied Persicaria of our ditches. The leaves are smooth, oblong-lanceolate, narrowed towards the base, and slightly serrated on the margins. From the mountains of Northern India. Introduced in 1848. Flowers in autumn.

Thibaudia Macrantha, Hooker. Large-flowered Thibaudia (Bot. Mag. t. 4566).—Nat. Ord., Vacciniaceæ.—A beautiful, but rather straggling evergreen stove shrub, with entire, smooth leaves on short thick footstalks. The

flowers are extra-axillary, two or three together; the stalks thickened upwards, and coloured red; they are large, upwards of two inches long, and an inch in diameter, pendent, with a small pale yellow calyx and flask-shaped five-angled porcelain-like corolla, contracted at the mouth, with the narrow segments of the limb reflexed, and the stamens and style protruded; the colour is "china white, yellow at the base and apex," the spaces between the angles marked with numerous distinct wavy red lines, generally taking the shape of the letter V. It is stated to be of easy cultivation, and to have flowered when not more than two feet high. Mr. Smith of Kew suggests that it will probably succeed in a close warm greenhouse. From Kola mountain, Moulmein. Introduced by Mr. T. Lobb about 1848. Flowers in winter. Messrs. Veitch of Exeter.

PLEIONE LAGENARIA, Lindley.
Bottle Pleione (Paxt. Mag., ii. t. 39). — Nat. Ord., Orchidaceæ § Epidendreæ-Cælogynidæ. — A beautiful little epiphytal stove plant, with flask-shaped pseudo-

2. Pleione lagenaria. 1. Thibaudia macrantha.

bulbs and lovely flowers issuing from a bract, which is hooded, acute, and much tapered to the base. The sepals and petals, which are linear-lanceolate and acute, are of a pretty rosy-lilac colour, as is the exterior of the rounded entire emarginate rolled-in lip, the inner surface of which at the margin is streaked with carmine on a white ground, and towards the centre is yellow, marked with five crested lines. From the Alps of India. Introduced by Mr. T. Lobb in 1849. Flowers in autumn. "The secret of their successful cultivation in England lies in keeping

them cool and dry when at rest, and forcing them with heat, moisture, and bright light, as long as they are inclined to grow." Messrs. Veitch of Exeter.

LIPPIA REPTANS, Kunth. Creeping Lippia.—Nat. Ord., Verbenaceæ.—Syn., L. strigulosa, Martens and Galeotti.—A spreading suffruticose perennial, with rooting branches, obovate cuneate sharply serrate leaves, and ovoid, or at length subcylindrical, heads of flowers, which are white, changing to rose, and ultimately to red. From South America, widely distributed, growing in humid places. Cultivated in the Botanic Garden of Berlin.

DIDYMOCARPUS CRINITA, Jack. Hairy Didymocarpus. (Bot. Mag., t. 4554).—Nat. Ord., Gesneraceæ & Cyrtandreæ—Syn., Henckelia crinita, Sprengel.—A dwarf herbaceous stove plant, interesting from the velvety richness of its foliage. The stem is short, erect, bearing opposite broad lanceolate, serrate leaves, which are hairy, and on the upper side of a dark coppery green, with a velvety lustre, on the lower side rich purple red. The flowers are white, with a yellow throat, funnel-shaped, with a ventricose tube, two inches long, and a spreading limb nearly an inch across; they grow from two to five together in the axils of the leaves, on longish stalks. From Pulo Penang. Introduced in 1846. Flowers in summer.

Epidendrum (Paxt. Fl. Gard., i. 184).—Nat. Ord., Orchidacca § Epidendreæ Læliadæ.—An inconspicuous stove orchid, with oblong coriaceous leaves, and a slender flower stem, bearing a few small flowers not at all showy, but curious from the remarkable lengthening of the filiform petals, which resemble the feelers of some insect. This lengthening is said to be an after-growth, the petals being short before expansion. From Xalapa. Introduced to the French gardens before 1850. Flowers in winter.

#### METEOROLOGY IN REFERENCE TO HORTICULTURE.

By Mr. J. TOWERS C.M.H.S., &c.

The have of late years been mystified by certain writers who affect to discern and predict the state of the weather by the "aspectal" position of the planetary bodies, (in which term are included the sun, and our own satellite, the moon). Astronomers have for years dismissed from their calendars most of those aspects which the planets assume in consequence of their orbital movements, retaining those of opposition and conjunction only. We question not that a mutual "disturbing" influence may exist between the heavenly bodies; but when almanaes, and other productions of a more fugitive character affect to foretell coming events, and to interpret those already bygone, from the position of the planets in their aspects of trine, quartile, sextile,—we look with suspicion upon such performances, and are apt to deem their object as more closely allied to astrology than to philosophy and true science.

Every gardener is interested in the weather: in each department of his profession he is, or ought to be, conversant with the effects of solar light; the power of heat under cover, or in the full exposure of the open air; the effects of rain in respect to quantity, its seasonable supply or redundance; and now, at this precise period, the critical state of the weather brings us to the consideration of the Equinoxes—those two periods when the sun shines perpendicularly upon the equator, illuminating the whole hemisphere of the globe, so as to produce equal (or nearly equal) day and night throughout the world.

A writer is authorized to quote from himself without incurring a charge of plagiarism; I therefore venture to cite the following lines from my "Naturalist's Calendar for March" in the *Domestic Gardener's Manual*:—

"The vernal equinox takes place during this month, and experience seems to authorize the conclusion, that, according to the character which the weather assumes about that period, the succeeding summer will, in all probability, be either wet or dry. Kirwan and others have given rules founded upon repeated observations, from which some probable opinion may be formed;—thus Kirwan said, 'If there be a storm at south-west or west-south-west, on the 19th, 20th, 21st, or 22nd of March, the succeeding summer is generally wet five times in six.' It appears to me to be placed beyond doubt, that, if north or north-west winds prevail on or about the period of the equinox, that is, from about the 18th to the 25th of the month; and especially if the barometer be high, and its mercury convex, that the succeeding summer will generally be dry. If, on the contrary, south or south-west winds prevail, if the weather be rainy and the mercury falling, the succeeding summer will, with greater probability, be wet. Will it be too daring to conjecture that, at the two periods when the ecliptic coincides with the equinoctial, the sun influences the electricity or the electro-magnetism of the earth, so as to induce a character or modification which shall predominate during the greater part of the following half-year."

To this effect I expressed myself in the year 1830, and now, after twenty-one years' experience,—to say nothing of the extensive observations of others long before my own commenced, I see no reason to retract a sentence from what I then wrote.

Within a few weeks past, Baron Reichenbach's admirable researches on magnetism have been studied,—and this work merits the best attention of every meteorologist. Chemistry, some time since adopted the word *Actinism*, in reference to the decomposing influence of light. The Baron has

produced his *Odylic* system, supporting it with facts numerous and astounding. By it, the agency of the moon and planets as opposed to that of the sun and fixed stars,—the latter shining by *their own inherent*, and not reflected light,—is exemplified.

To return to the Equinox,—the one just past: it occurred on the 21st March ult., at 4h. 56m. in the morning. The character of the wind, the weather, and the very great depression of the barometer,—are signs that cannot be doubted. Wind and rain to excess from the 17th to the 27th inclusive, give warning of a drenching season!

Our agriculturists and gardeners are therefore called upon to observe attentively, and to be prepared! We may, as in all mundane affairs, find this summer an exception to the rule; but, comparing the Calendar in "White's History of Selborne," with assured observations during a very long period, it may be considered as established by genuine facts. The 30th of March was the first day that offered any promise of a change: the land was drenched to saturation even in this driest of counties (Surrey). The balance of rain has been now restored; and the occurrence of a fortnight or three weeks of dry weather following the profuse rains of the latter half of March, has given a propitious seed-time.

### ON THE CULTURE OF THE VENUS' FLY-TRAP.

By Mr. Brown, of the Tooting Nursery.

MHE Fly-trap is the Dionæa Muscipula, a plant which has already been so often described, and is a so well known, that I shall not detain the reader with any descriptive remarks. My object is rather to offer a few hints on the culture of this beautiful and interesting plant—one of the greatest curiosities in the vegetable kingdom, and one which is generally considered difficult to grow. It is a native of Carolina; and coming from a comparatively cold part of the world, many persons imagine it will not stand heat, or at least not that degree of heat that is generally kept up in our stoves. It is, however, a plant that will bear more heat than is generally supposed; but when it is in a stove, or an Orchid-house, it is frequently shaded too much and kept too far from the glass. I trust the few hints I shall offer respecting its culture will enable any person who feels anxious to do so, to grow the Venus' Fly-trap, which is so interesting that no collection of tender plants should be without it. The sensitive property with which it is endued, is one of the most remarkable phenomena in the vegetable world.

For soil, use equal parts of fibrous peat, and of sphagnum cut very short, mixed with a little sand. The pots should be well drained; five-inch pots are in most cases sufficiently large. After the pots are drained, and filled with the soil, make a hole in the centre, in which place the plant, and carefully press the soil close round about it. Then on the top, and all round the plant, should be placed a little green moss, cut fine; the surface should be clipped level, and neat, with a pair of scissors, and care must be taken not to bury the heart of the plant. Give them a good watering with a fine-rose watering-pot to settle the soil. The best time for potting is about the month of March. I would recommend to shake them out of the old soil every season and pot them in fresh soil.

The plants thus potted should be placed in shallow pans of water, at the end of a stove, or an Orchidhouse, on a shelf, about eighteen inches from the glass. At the end where they are placed, shading will not be required, but the glass may be painted with a little thin paint just over them; or which is still better, with some paste in which a little whiting, dissolved in hot water, has been mixed; this must be used with a brush, on some dry day, to allow it to get thoroughly dry, or the rain would wash it off. In winter a little hot water with a brush, will soon wash it off again; and at that season the light will prove beneficial to the plants.

Watering must be carefully attended to. After the plants are potted, and placed on the shelf in March, syringe or water them with a fine-rose water-pot once a day. As the plants increase in growth, and the summer advances, water must be applied oftener. By the latter part of May, and in June and July, when the sun is very powerful and hot, they should be watered ten or twelve times a-day; but when the weather is cloudy three or four times a-day will be sufficient. The stronger the sun the oftener they will require watering. As autumn advances decrease the water by degrees; and when the plants are at rest in the winter, water applied once or twice a-week will be quite sufficient.

The plants must be kept clean, and the moss clipped often, so as not to allow it to cover the heart of the plants, as that would choke them and soon produce death. This treatment will secure short and strong leaves, with the lobes large, lying close on the moss, and of a beautiful healthy colour, instead of being drawn long and slender and having a sickly colour, as is too often the case. The flower stalks should be pinched off whenever they appear, to encourage the growth of the plant, the

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flowers being very insignificant, the beauty and singularity consisting in the trap formed of the sensitive lobes of the leaves.

The Dionæa is increased by divisions, at the time of potting; the plants may then be parted when there is more than one crown. Sometimes they emit young plants at the base of the leaves. Seeds are also sometimes produced by which they may be increased. The pot for sowing these should be prepared as recommended for the potting—only use a little very fine soil on the top to receive the seed; this soil is to be pressed even, the seed scattered over the surface, and covered very thinly with short moss. The seed pots must be watered as recommended for the established plants. The seedlings are to be potted off when large enough, and treated like the others.

### THE ROSE GARDEN.

#### By Mr. G. GLENNY, F.H.S.

THE CLASSES AND QUALITIES OF ROSES.

MHERE has been raised a general complaint among those who have fancied that a great variety of roses was desirable. They have seen a trade catalogue, which contained some hundreds of names, divided into more than a score of families, with certain distinctions which have been either not understood, or altogether deceptive. For instance, the family distinguished as "Rosa Alba," contains varieties of many colours, although many persons fancied that it meant white; the "Damask" family comprises colours very different from Damask. Although we are not the first to call for the change, we quite agree that the arrangement of the catalogues should be altered. Persons who have selected from the descriptions and family names in the trade lists have, perhaps, ordered one hundred varieties; but have suffered such a complete disappointment that they would readily, if they could, clear their gardens of three-fourths, when they have seen the true character of such flowers as hybrid perpetuals, that bloom for a shorter time and worse than the old cabbage rose; hybrid chinas, that flower but little; many with soft flimsy petals, others with semi-double flowers; some so nearly alike as not to be distinguished by the common observer, others of exceedingly awkward growth, scarcely manageable as standards; besides a great number which flower nearly three weeks in the season, and all the rest of the summer and autumn, form ugly objects in the borders or on the lawns.

We think that the families are badly distinguished, and that now, as seedlings run so much out of one into another, the sections ought to be so arranged that all men can understand them: Moss Roses are understood by every body. Summer Roses should comprise all those which bloom a month only. Noisettes—all those which flower in bunches. Continuous bloomers—call them any name you please—all those which are of the nature of the old China, growing and flowering till the frost cuts them off. Climbing—all those which make strong long shoots every season. Everybody would then understand what the distinction meant; but who cares whether a Rose be Damask, Gallica, Alba, Bourbon, Perpetual, China, Provence, or Hybrid to any of these, if he can but understand whether it be a summer Rose of a month, or a continuous blooming Rose to decorate his garden half the year? What boots it that a Rose is a Hybrid Perpetual, or a Hybrid China, if it is to be bare of flowers all the year, but June or July, or half in each? A collection of a hundred varieties of Roses, forming a line on each side a path is often truly a miserable sight; nothing makes a more ugly blank than a bare Rose tree. Instead of a man boasting that he has a hundred plants always in flower, and comprising half-a-dozen of the best in cultivation, it is the fashion among those who lose sight of effect, to boast of having so many varieties.

The Rose-buyer should recollect that in *The Properties of Flowers and Plants* (Cox, London) there are the full particulars of what a Rose should be, and it is the only work in which the properties which constitute perfection are laid down. We are not going to elaborate on these properties, but there are some leading points which must not be lost sight of, and among these, that first of all qualities among garden flowers—continuous blooming. A Rose-border or plantation that belongs to the general features of the garden ought never, during the season, to exhibit bare Rose-trees; better have twenty of one sort than plant those which are of temporary beauty. From the authority to which we have referred, we learn that a Rose should be circular, full on the face, thick and smooth on the petal, very double, and very symmetrical. All these points are essential in flowers to exhibit; but Roses, for this purpose, should be grown together, because, many of them, however temporary their beauty as plants, are grand when cut; and they are wanted only when Roses are shown.

Roses, however, that form part of the features of a garden, should be always in bloom, if possible. Let them be of good habit, to form a fine head; never mind having a dozen of a sort. There is not a finer object than "a rose-tree in full bearing." There is hardly a more ugly object than one growing

into long shoots, and bare of flowers. Let your collection, if you must have one, be out of the way of the walks. Give them a place to themselves, that will not interfere with the brilliance of the flower borders, or the decorations of the lawn. And really, in the collection, a good deal of discrimination is wanted, or you get crowded with varieties which have nothing to recommend them. Thin petalled roses will not bear the sun, they are naturally fragile; semi-double roses are useless in the collection, though some are adapted for garden ornaments, because always in bloom; and two or three seasons will throw out of cultivation at least two-thirds of those which only bloom one month in the year. No one ought to order a rose from seeing a bunch of its cut flowers. Some which look well in a bunch are good for nothing; the plants are of bad habit, the bloom scarce; some weak in the foot-stalk, and cannot bear their own weight; some loose the instant they open, though when bunched up close, and young, they do not show their fatal blemishes. Everybody who looks at a bunch of flowers should remember that they may be all the blooms that could be gathered from half-a-hundred trees, or they may be forced, or grown in pots, and when they come to be grown by the purchaser, he may be hardly



A PERFECT ROSE.

able to recognise them. ladies and gentlemen make notes at shows, and order what they admire; they forget, when they see a fine-looking Rose in a pot that the plant is tortured with sticks and ties, and when they see cut flowers, rarely give it a thought that a fine bunch of bloom may be the gatherings of a whole nursery.

However, Roses are, or should be, all planted now, and we strongly recommend every grower to note them as they bloom; to order nothing without seeing the plant at a nursery, or elsewhere; to give the preference to round, full, thick-petalled symmetrical flowers for exhibition, and lasting bloomers for the borders and

True florists grow general collections for effect, show-flowers for exhibition. The cultivators of the Rose, like the grower of Auriculas, Carnations, Tulips, and other flowers, possess many varieties for effect in collections, which would not be tolerated as show-

flowers; and these inferior kinds, which are kept for some remarkable feature, will continue to hold their place as stage or bed varietics, until others are raised to displace them with better qualities. Let the Rose-grower who exhibits, decorate his garden with all the fine show kinds which continue to bloom all the season, and make up with such inferior sorts as possess that admirable quality and make a variety of effect; and collect all the summer kinds, which he must have for June and July shows, in one place, where their bare and ragged forms shall not be noticeable as a feature—for some of the summer Roses, and even some called Perpetuals, but which are quite as temporary in their flowering season, are so truly splendid in their individual blooms, that a shower would have no chance of success without them.

Growing Roses in pots, as taught by popular cultivators, is merely producing artificial-looking plants: even those who pretend to teach, and who show their own handiwork, merely show plants drawn too much to hold up their flowers, and propped and staked and tied into the best shape they can be made assume. Oh that the public societies would forbid the use of props! A single season would then show us the real gardener. We think very lightly of gardeners or nurserymen who cannot grow a plant to support itself, and the public will participate largely in this feeling. The reign of props, and ties, and supports for potted Roses is drawing rapidly to a close.





#### RHODODENDRON CINNAMOMEUM CUNNINGHAMI.

Nat. Order.-Ericaceæ & Rhododendreæ.

Generic Character. — Rhododendron, Linnæus. — Calyx five-parted. Corolla hypogynous, funnel-shaped, or somewhat bell-shaped, limb five- or more rarely seven-parted, equal or somewhat two-lipped. Stamens hypogynous, or inserted at the bottom of the corolla, equal in number to its divisions (five) or very often twice as many (ten or fourteen); filaments thread-like, ascending; anthers unarmed, the cells bursting by an oblique pore at the summit. Ovary five- or ten-celled, cells with many ovules; style thread-like; stigma capitate. Capsule globose or oblong, five- or ten-celled, septicidally five- or ten-valved, the valves separating from a free central placentiferous column. Seeds numerous, with a loose reticulated testa; resembling fine iron filings to the naked eye.—Shrubs or trees, natives of the Alps of Europe and Central Asia, and of North America, and the continents and islands of the East Indies;

many hybrids existing in gardens through accidental and artificial crossing of species; leaves alternate, quite entire, evergreen or deciduous; flowers corymbose, showy, yellow, rose, purple, or white.—(Endlicher Gen. Plant. 4341.)

Rhododendron cinnamomeum, Wallich.—Leaves lanceolateacute, obtuse at the base, clothed with intense rusty tomentum beneath; limb of callyx short, callous, five-lobed; ovary tomentose, ten-celled.

Var. Cunninghami.—Cunningham's White Rhododendron.—Leaves elliptic, acute at both ends, 7-8 inches long, wrinkled, elothed with short close tawny tomentum beneath; flowers in large pyramidal heads, pure white, with deep purple spots.

Syn.—R. cinnamomeum Cunninghami, Lindley in Paxton's Fl. Gard. i., t. 16.

ESCRIPTION.—A noble evergreen hardy shrub. The branches are reddish-brown, stout. The leaves large, measuring seven to eight inches long, broadly lanceolate, more acute at the base than in R. cinnamomeum, its male parent, and in this respect more nearly resembling those of a white variety of R. maximum, its female parent; but in their texture, and in the sunken veins and wrinkled upper surface, agreeing with cinnamomeum. The under side is covered with a short close pile of pale ferruginous scales, in colour, as in size, exactly intermediate between the two parents; the leaves approach those of maximum in convexity. The flowers form large dense terminal pyramidal trusses; they are large, with broad rounded segments, pure white, marked on the upper segment with rich deep purple spots, and with a blotch of purple at the base.

HISTORY, &c.—This fine variety, equalling, no doubt, the best that has been yet obtained, was raised from a white variety of the late-flowering maximum, crossed with cinnamomeum. It was reared by Mr. Cunningham, nurseryman, of Liverpool, who thus states his object, and the result of his attempts to realize it:—

"In the mountainous regions of India when the snow disappears, the tropical heat soon pushes into flower the Rhododendrons found there. In our variable climate, in which we are never safe from frost till the middle of May is past, the great desideratum must be not only to preserve the noble form and beautiful colours of the Himalayan species, but to postpone the period of flowering till the nipping frosts have passed away. As the American maximum is nearly a month later in blooming than Catawbiense or Ponticum, I selected a pure white variety of that species, and having succeeded, though not without some difficulty, in forcing it into flower, hybridized it with Cinnamomeum, and the result is the plant you are about to figure. The pure white colour of each parent is preserved, with the rich purple spots of Cinnamomeum, and the period of flowering postponed till the middle of May."

Mr. Cunningham informs us that his new variety is perfectly hardy, none of his plants having received any protection; this was indeed to be expected, seeing that its female parent is one of the hardiest of the race, and its father capable of enduring any amount of cold, previously to its starting into growth, which, unfortunately, it does too early for our climate. This tendency has, however, in the hybrid, been counteracted by intermixture with one of the latest of all Rhododendrons. The size of the truss of bloom is one-third larger than the size of our page would enable us to show it; the individual blossoms measuring fully three inches in diameter.

CULTURE.—Being perfectly hardy, nothing more is required than the treatment usually given to hardy American plants.

Mr. Glenny's remarks on the points which constitute perfection in the Rhododendron, viewed as a florists' flower, are subjoined:—

"This noble family has been mentioned in 'The Properties of Flowers and Plants,' with nine rules setting out the points required, the substance of which is, that—the petals should be thick, smooth, and stiff; the individual flowers round and campanulated like a globular cup; the divisions imperceptible; size large; truss a close cone; colour dense or bright; spots richly contrasted; footstalks stiff and clastic; plant bushy; foliage bright. Ponticum is the worst, and all that show their divisions so conspicuously are worthless; though a new colour may save for a time a bad shape. Hardiness is a great point; though greenhouse varieties are among the richest ornaments of the vol. 111.

conservatory. When the footstalks elongate and loosen the truss, it is the worst fault the Rhododendron can possess; we ought not to be able to see between the flowers at any time."

It is just now an interesting problem with cultivators, what horticultural value the new Sikkim species may possess. Should they prove cultivable, and equal Dr. Hooker's representations, some of them will be splendid acquisitions.—M.

# Vegetable Physiology.

BY ARTHUR HENFREY, Esq., F.L.S., Lecturer on Botany at St. George's Hospital.

GERMINATION.

MHE independent bodies thrown off by perfect plants for the reproduction of the species, are called A spores in the Cryptogamous, and seeds in the Phanerogamous plants; these two kinds of bodies are very different in their nature and construction, the first representing an earlier stage of the second; thus the phenomena which are comprehended under the name of germination are very distinct in character in the two cases. The spore, as cast out from the parent capsule, consists of a single cell of microscopic size, possessing, apparently, two or more coating membranes, one of which, in the higher forms, is indeed said to be of a complex nature, consisting of a layer of very minute cells arranged like an epidermis. In the germination of the higher cryptogams, the spore undergoes a course of development which, in its early stages, may be compared to the production of the embryo in the ovule of the flowering plants, while still contained in the seed vessel; and it is not until a subsequent period that the formation of the regular permanent organs of the plant commences. Thus, while the spore of the Conferva simply grows at once into a filament by elongating into a tube which becomes divided off into separate cells by the production of cross partitions; the spore of the mosses is first developed, almost precisely in the same way, into a conferva-like germ, from which a bud at length arises, ultimately producing the regular moss stem with its leaves and capsules. In the ferns, again, the spore cell is first developed into a flat cellular plate resembling a Liverwort, upon which a bud is afterwards formed, whence the fronds of the regular form arise. This mode of development is rendered the more interesting from the fact that there appears to be good ground for believing that, in some cases, a process of fertilization, somewhat resembling that effected by pollen upon the ovules of flowering plants, takes place upon these germs after their complete separation from the parent—for example, in the ferns, as already described in this Magazine (p. 22).

The most remarkable point, however, with regard to the germination of spores, is one that they have in common with seeds, namely, the capability of retaining their vitality in a state of rest for an indefinite period, when no injurious influence is allowed to act upon them. That this is possessed by some spores is proved by the frequently repeated experiment of raising ferns from spores taken from plants preserved in herbaria: and it seems impossible to doubt that a similar power resides in the spores of many lower cryptogams which only become developed in peculiar circumstances, as with parasitic Fungi, the spores of which must often be floating in the atmosphere, ready to germinate when they light on an appropriate nidus. Other spores seem to be more perishable, since M. Thurst found it impossible to make any but fresh spores of the Equiseta germinate. In general, warmth and moisture, as with seeds, are sufficient to stimulate spores into activity. It remains a question whether or not those of parasitic Cryptogams germinate on other bodies besides those on which the perfect form of the species is produced; the hypothesis that these spores produce fungi of different form according to the nidus upon which they germinate, is so contrary to our general notions of specific differences, that it requires much better proof than we have at present before it can be accepted.

The germination of seeds is so familiar a phenomenon that it is merely necessary to dwell upon the peculiarities which distinguish it from that of spores, and the more striking variations of character in different seeds. Almost all seeds contain a perfect rudiment of a plant, one or more leaf-like organs seated on the summit of a little root-like process, with a nascent bud between or within. In some cases this rudimentary plant or embryo, wholly fills the seed-coats, as in the Beans, Lupins, &c.: in such cases the leaf-like parts, or cotyledons are large and thickened, containing the nutrient matter to support the growing plant in the earlier stages of germination; in other instances the embryo is comparatively small, and is imbedded in a mass called the albumen, from which it draws its nourishment in the outset of its development.

A certain number of plants have a more rudimentary form of embryo, as the orchis tribe, and many parasites, where no cotyledons can be distinguished; such cases we may regard as instances of an arrest

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of the development at an earlier stage than in the more perfect embryos, since the germs that do exist are cellular masses just like those of the more perfect forms before their cotyledons are formed.

During the ripening of seeds the cells of the albumen, or of the cotyledons, become filled with collections of accumulated nutriment in the form of starch, oil, or mucilaginous matters, or in some cases in the form of secondary layers thickening the walls of the cells; at the same time the greater part of the water is removed and the seed becomes dried to a certain extent, the chemical activity of its contents is arrested, and it remains in a state of rest until excited to new development by exposure to heat and moisture. Different seeds have very different degrees of power of persistence in this state of rest, but it is striking to note what great resistance many offer to external influences. The seeds of the Cereals have been found to bear a short exposure to a heat of 112' Fahr. in water, 140° in steam, and 168' in dry air, as well as a dry cold of 90' below the freezing point. Under favourable conditions some will retain their germinative power for centuries; others decay if not sown almost immediately they are ripe; this is the case especially with seeds containing much mucilaginous matter, which is readily decomposed.

As the seed unfolds, the assimilated matter in the cells of the cotyledons, or the albumen, becomes dissolved and converted into gummy or saccharine matters, which are at once applied to the nourishment of the young plant. In some cases even a portion of the cellular structure is dissolved and assimilated; this is the case with some kinds of cereals; more frequently there exists a much greater store within the cells than is necessary for the plant before its rootlet becomes capable of absorbing fresh matters; and as is especially noticed in seeds with abundance of horny albumen, a large portion of this matter is left untouched. The decomposition of the store of nutriment is accompanied by the absorption of oxygen, the separation of carbonic acid, and the temperature of the seed rises. It is not clear at present whether this expenditure of the carbon of the seed, by being burnt, as it may be termed, with the elevation of the temperature, is a part of the assimilative process, or is a separate process having merely for its object the liberation of heat to act as a stimulus upon the nascent organs; but the necessary consequence is, as experiment has also shown, a loss of weight of organic matter during the germination.

There are few points concerning which more has been said and written than on the cause of the direction taken by the opposite extremities of the axis of the nascent plant, of the downward growth of the root and the upward of the terminal bud. One of the most universally adopted views has been that which explains the growth downward of the radicle by gravitation. Mr. Knight stated that he made roots grow in an oblique direction by causing the seeds to germinate on a revolving wheel so that the centrifugal force partly counteracted the gravitation. Whether this experiment would show a constant result is uncertain, but even if it did it would not suffice to prove that gravitation was the cause of the root penetrating the earth, for the portion which grows upward is frequently the heaviest end, and yet at the same time, rises in a lighter medium. Moreover, the mode of germination of the Misletoe and other parasites upon the stems of trees shows that the direction is governed by some much more special influence than the universal law of gravity. So far as we are in a position to tell, there is some definite, and as yet unknown, cause which makes the radicle first grow towards the earth or other source of nourishment, which it penetrates by clongation, a resisting point being offered by the weight of the seed or the earth covering it; and then, in its further growth downward, it requires a point of resistance to be afforded by the adhesion of the earth around the collar of the root, since the elongation takes place in the structures just above the point of the root, thus exerting a pressure upwards and downwards, which if the upper part of the root be kept free, and the weight of the plant balanced, will cause the whole to rise bodily upwards. Thus when seeds germinate in damp moss lying upon a hard surface, the elongation of the root will push the stem up through the moss, unless the root branches so as to get fixed down by entanglement among the loose matters.

We may admit, therefore, that we are at present totally ignorant of the cause of the direction taken by roots, all the notions hitherto advanced having been purely speculative.

The time which is required for germination depends greatly upon the texture of the coats of the seed, and in particular on the covering it may possess belonging to the fruit; naked seeds usually germinate much sooner than those enclosed in a seed-vessel, like the achenes of the Rose tribe &c. It is worthy of remark that many of the seeds which are enclosed by a hard shell or stone, germinate naturally in the midst of a decaying pulp, which must contribute to the decomposition of the shell. Soaking such seeds in water or causing them to pass through the digestive canal of animals, as by feeding fowls on the Hawthorn fruits, greatly accelerates germination.

Almost all the questions relating to the chemical changes which occur during germination remain to be cleared up, which can only be done by the co-operation of chemists with practised vegetable anatomists, a conjunction greatly to be desired for vegetable physiology generally. It is in the power

of many others, however, to forward our knowledge of this class of phenomena by experiments upon germination under different physical conditions, various directions of illumination, &c., the repetition of Knight's experiments and modifications of them. The structural changes, such as the development of the bud and leaves require no especial mention here: it may be remarked, however, that the cotyledons, when they rise above ground, become coloured green like the other parts exposed to light, acquiring fully the functions of leaves.

#### THE CHEMISTRY OF SOILS AND MANURES.

By Dr. A. VOELCKER, Professor of Chemistry in the Royal Agricultural College, Cirencester.

Inorganic matters—manganese, silica, sulphur, phosphorus, chlorine.

ANGANESE is a metal which, in combination with Oxygen, as Oxide of Manganese is associated with the oxides of iron, occurring naturally in almost all soils. Manganese is found in all iron ores; and, on the other hand, iron constantly accompanies manganese ores. Generally speaking, only traces of oxide of manganese occur in soils. In the ashes of plants likewise traces of manganese compounds may be detected; but iron usually preponderates in the same. The ash of the horse-chesnut, oak-bark, and a few other barks, however, present us with some exceptions to this rule, inasmuch as these ashes are rich in manganese, and contain but traces of iron.

8. Silica.—Common sand, sandstones, flint, chalcedony, rock-crystal, quartz-rock. different names given to varieties of one and the same substance, which by the chemist is called These varieties are dependent on the physical characters of the substance, as Silica or Silex. greater or smaller transparency, the degree of hardness, etc., and the admixtures which are found in it naturally. Common red sand and all red sandstones are impure varieties of silica, the impurities being iron and manganese, traces of lime, magnesia, etc. Flints are a purer form of silica; white quartz-sand and quartz-rock are almost pure silica; and the same substance is called rockcrystal when it occurs in a state of perfect transparency. Silica occurs in nature abundantly, either in a free state in one or the other of the above varieties, or in a state of combination with lime, magnesia, iron, potash, soda, and other mineral matters. Many minerals and rocks are entirely composed of such natural silicates. In soils, particularly those termed silicious, silica or silex, forms by far the largest proportion of its constituent parts, amounting often from 80 to 90 per cent. of the whole weight, when dry. Silica is entirely insoluble in cold and hot water; and resists likewise the action of strong acids, with the exception of hydro-fluoric acid, which dissolves it, and which, on account of this property, is used for etching glass—an artificial silicate of potash or soda, and silicate of lime or lead. Though infusible at the strongest heat, yet when mixed with potash or soda, and exposed to the heat of a glass-furnace, silica dissolves in the potash, or rather enters into combination with the alkali, and forms with it a transparent mass, or glass. If an excess of alkali has been employed in the process, the resulting fused mass dissolves completely in water. On addition of muriatic or sulphuric acid to a solution of silicate of potash or soda; the silica separates in the form of a voluminous, white gelatinous mass, in which form it is soluble in a large quantity of water. All fertile soils contain more or less silica, in a state in which it is soluble in water, and thus capable of being taken up by the roots of plants.

9. Sulphur.—This well-known yellow combustible substance does not occur as such in soils, except in volcanic districts; but in the form of sulphuric acid, this element enters into the composition of all cultivated land. Sulphur, in small proportions, is a constituent of some vegetable principles, but it is chiefly present in plants in the form of sulphuric acid, in combination with lime, magnesia, potash, and other bases. The sulphuric acid is probably derived directly from the sulphates in the soil; and there appears good reason to suppose that the sulphates furnish the plants likewise with the sulphur requisite for those organic compounds containing this element.

With hydrogen, sulphur forms a very disagreeable smelling gas—sulphuretted hydrogen, which being a product of the decomposition of organic matters, is frequently contained in the soil, and dissolved in water. Some springs, for instance, those of Harrogate, are so strongly impregnated with this gas as to present the characteristic smell of sulphuretted hydrogen in a marked manner.

10. Phosphorus.—When phosphorus, a soft, wax-like, highly inflammable substance, which is not found in nature in a free state, is lighted, it combines with the oxygen of the atmosphere, and gives rise to dense white fumes, which may be condensed by placing a bell-glass over the burning phosphorus. On the sides of the glass they become condensed to white crystalline, very deliquescent, flakes, constituting a highly acid compound, namely, phosphoric acid. Phosphoric acid is a most

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important substance, as it enters into the composition of all our cultivated plants, and its presence in the soil is essential to a healthy condition of vegetable life.

The most important natural phosphates have already been described, and I will mention, therefore, only that phosphoric acid, as shown by the researches of Professors Fownes, Bischoff, Sullivan, and others, appears to be much more universally distributed than was formerly believed. Many granite, trap, basaltic, and other igneous rocks contain traces of phosphoric acid. Professor Fownes detected its presence in the clay of Dartmoor, in trachyt from Germany, and in basalt from Derbyshire; and phosphoric acid has further been discovered by him and other chemists in lime and iron-stones, and a great variety of other rocks and minerals.

11. Chlorine.—The last substance which we have to mention, as entering into the composition of soils, is a highly noxious, suffocating, yellowish gaseous element, of a peculiarly disagreeable smell, resembling that of bleaching liquor. In soils, chlorine is only found in combination with bases. Its most important combination, Chloride of Sodium, or common salt, has been already noticed.

#### EDIBLE LILIACEÆ OF SIBERIA.\*

MHE disease with which the potato has of late years been attacked has excited inquiry among A botanists and agriculturists as to the plants which are most suited to replace, at least, in some measure, this precious vegetable. Unfortunately, none of the species proposed by cultivators combine all the excellent qualities of the potato-easy culture, ready and fecund propagation, abundance of nutritive matter, agreeable flavour, and easy digestion. The Yam, the sweet potato, the Manihot, require tropical temperatures; and their culture, which alone might be placed on a level with that of the potato, is completely excluded from northern latitudes. The Tropæolum tuberosum has too strong a taste; the artichoke, the merit of which in other respects is incontestible, and the oxalis, are too watery; the Apios requires a great deal of ground for its culture, and soon becomes hard and unpalatable; the Psoralea esculenta does not realize the hopes that were at one time entertained of it; the Camassia esculenta has, perhaps, a stronger claim to notice than the two last of these vegetables, if, at the same time, it is readily propagated. Of all the plants cited, the Camassia is the only one which may be compared with the Liliaceæ of Siberia, which have for a very long time served as food to the inhabitants, and which, therefore, merit greater attention among horticulturists. The large-flowered variety of the Erythronium Dens can is generally grown in the middle of Eastern Siberia, and is there prized as a most excellent article of food. Formerly, indeed, it was the custom to send an annual supply to the Court of St. Petersburg. Its propagation from seed is very easy and sure, and the plants always produce plenty, but they require three years before the bulbs attain their full size. Its local name is Kandyk. The lilies receive the name of Sarana; and it is especially the Lilium tenuifolium, and the Lilium kamschatica (Sarana kamschatica, F.) which are the esteemed Edible species. Lilium spectabile is equally employed as a nourishing article of food. These three plants are propagated with great facility. Lilium tenuifolium is propagated almost exclusively by seed, the two others also by the seales; and it appears that every one of the seales of the bulb, which are long and pointed in Lilium spectabile, thick, short, and roundish in the Sarana of Kamschatka, forms a new plant. This mode of propagation is even essential for the Sarana of Kamschatka, as it rarely bears seed. There is also at Kamschatka a lily which comes near Lilium canadense, but which I name Lilium avenaceum, after the name which it bears in the country, and from the form of the scales of the bulb resembling large seeds of corn. This species is not yet introduced to gardens. In its native country it is eaten like the ordinary Saranà, which is, however, preferred to it. In no part of Siberia are these useful plants cultivated; everywhere it is the bulb of the wild plants which is gathered, and it is gathered in abundance. Lilium tenuifolium and L. spectabile are first met with in the eastern part of the government of Tomsk, and extend around Baikal; and in all Siberia, in the same direction (Daouria), as far as the eastern ocean. The Sarana of Kamschatka is found along the shores of the eastern ocean, and also at Kamschatka, as well as on the islands lying on the eastern side of America. It is only with very careful culture that any satisfactory results are obtained in improving it. In the south of Russia the heaths and waste lands are covered in the spring with tulip-flowers. Among these tulips there is one known well enough on the banks of the Don, in Russia, and which, perhaps, does not differ essentially from Tulipa suaveoleus, and which is eagerly sought for and eaten by the inhabitants, who readily distinguish it from other species which they never touch .- Dr. Fischer.

\* From The Flore des Serves, &c.

#### REMARKS ON MELON GROWING.

By Mr. J. L. MIDDLEMISS, GARDENER AT BENTHAM HILL, TONBRIDGE WELLS.

TRHERE can be no doubt that a house heated with hot water, is, for the culture of Melons, not only the most economical structure as regards labour but also superior, in every point of view, to the old pit or frame, heated with fermented materials; nevertheless, the great majority of growers are like myself, obliged to put up with the inconvenience of the old frame or pit; and as good melons, and plenty of them, can be, and are, grown in these, I will confine myself to their culture in such structures.

The soil that I have found best suited for Melons is turfy loam (Epping is the best), fresh, chopped up, but not too fine, and mixed with a few broken bricks, lumps of charcoal, or bones, to ensure porosity to the mass. Notwithstanding I prefer this sort of soil, they may be grown in loamy ditch scourings, or any other material of a like nature, provided care be taken to ensure thorough drainage by mixing with it any of the materials above stated: in fact, I have seen excellent Melons grown in nothing but pond-mud and lime rubbish. The bed of soil in which they are grown should be two feet deep—say eighteen inches of the finest on the top, and six inches of the roughest over the drainage at bottom; thus the rooting medium will be two feet. Previous to putting soil into the frame or pit, I put a layer of turf, with the grassy side downwards, all over the dung or drainage. This prevents the dung burning the roots, and in pits keeps the loose soil from getting down amongst the drainage; but it is of further importance, as will presently be explained. In putting the soil I carry up under each light two inch drain-pipes. This is for the purpose of pouring water down, which will spread over the turf and keep the rootlets in a healthy state when the fruit is ripening, and when watering on the surface-soil must be discontinued.

In planting out, select plants of a healthy green and growing appearance. If the bed is ready they may be ridged out when they have produced two rough leaves, but if not ready, care should be taken to prevent the plants becoming pot-pound (as they never get over this), by frequent shiftings: they will then feel no check from being turned out of the pots. In planting it is well to use a little loam and leaf-mould for them to start into, and I always draw up a hill to plant on, five or six inches higher than the surrounding soil, and never water nearer the stem of the plant than the outside of this hill; this prevents canker. One plant under a light is sufficient; if intended to grow them on trellises, they should not be stopped till they reach the required height; but if intended to be grown on the surface of the soil I stop them at the fourth joint. Three or four shoots will then be produced which should be pegged down to the soil, and not stopped till they reach the sides of the pit or frames, their ends are then pinched out. They will then produce plenty of fruit-bearing shoots, and as soon as there are a sufficient number of female flowers expanded, I dust the pollen of the male blossoms over them, and stop the shoots one joint from the fruit, keeping the atmosphere of the frame rather dry for a few days, till all are fairly set. I then select, say five or six on each plant, of the most evenly swelled fruit and place them on pieces of slate, pinching off all other fruit that may have set. this period I use very little water, merely damping round the frame, say twice a-day; and never at any time during the whole course of their growth watering over the leaves. Water should always be given under, not over, the leaves, and always at the same temperature as the soil. This is imperative. I shut up early in order to secure a considerable degree of solar heat; indeed this is the time when the maximum should be attained, and if the temperature by sun-heat rise to 90°, or even 100°, the plants will luxuriate in it. This is the only time when the frames should be shut up close; they should be opened again in the evening, and the lights kept a little tilted all night, to ensure a free circulation of air. This, of course, would be wrong if there were any danger of frost or cold easterly winds getting in. If it be found necessary, from a deficiency of heat (but this should be avoided if possible), to have the lights quite closed all night, care should be taken to give a little air before the sun shines on the plants in the morning, as this is particularly injurious to them after being shut up all night. I never, at any time, shade my plants, unless it be very early ones, after a long course of dark damp weather, when, the sun breaking out with unclouded brightness, would scorch them up. Here many err, thinking to let their plants have every blink of sunshine, the glass is wiped and every particle of shade removed, when it frequently happens, on visiting them half-an-hour afterwards, they are found with their leaves curled up as if they had been watered over head with scalding water. They should be gradually inured to bright light and sunshine. This, of course, relates to early Melons; we do not expect very dark weather in May or June.

I generally keep the temperature at from 60° to 65° by night, and from 70° to 75°, allowing a rise of 10° by sun-heat. But it would be wrong to take this as a fixed rule: regulate the internal by the

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state of the external temperature, lowering in dark cloudy weather, and raising with an increased degree of light and heat; but it is always well to have plenty of heat at command, in order to ensure the free admission of air, day and night, without which it is impossible to have good Melons. I keep the shoots well thinned out to allow the air to circulate amongst the leaves freely, making it a rule to pinch off a few at a time, rather than a great many at once.

Though I have grown Melons without water, early ones in particular, they are lovers of plenty of moisture at the roots when the fruit is swelling, more especially the Persian and Cabool varieties. An officer of the 29th regiment remarked to me the other day, that he had found them in their native habitats growing by the sides of streams amongst the wet mud, and luxuriating as if it were in a "hot ditch." I give plenty of water when the fruit is swelling, and frequently give weak clear liquid manure. As soon, however, as the fruit has ceased swelling, watering on the surface soil must be discontinued, as watering would then injure the flavour of the fruit. Still, however, I would not entirely withhold atmospheric moisture, but employ it in subdued quantity, believing that a healthy action of the leaves is indispensible to the production of highly flavoured fruit. It is about this time that the pipes spoken of above come into use, and if a nice bottom heat be still maintained, small quantities of water may be poured down, which will spread over the turf, to be absorbed by the tender rootlets, which will ramify over every part of the turf, and thus be ready after the fruit is cut to start into action for the production of a second, or even a third, crop of fruit.

A good state of health is almost insect-proof, but in order to make "assurance doubly sure," it is well to make a paint of sulphur, soot, lime and clay, and put a few daubs in different parts of the frames; the fumes of this will annihilate all the tribe of red spiders, and will not injure the plants.

I cannot close without recommending as a late Melon, a variety called the Dampsha; it does well to follow a crop of frame potatoes, and it will keep for two months after being cut. I have not seen it mentioned in any of the nursery catalogues, though it is nearly A. 1, in point of flavour. I had seeds from Mr. Ogle last year, whom I beg to thank publicly for bringing into notice this excellent variety.

## VEGETABLE TERATOLOGY.\*—ABNORMAL CALCEOLARIAS.

By Dr. MORREN, Professor of Botany in the University of Liege.

MHE Abbé Van Oyen, professor of physical and natural sciences of St. Trond, sent me a collection of very remarkable Calceolarias, among which two forms of the greatest interest were carefully preserved. The Abbé truly observed, that it was desirable not to forget those extremely rare cases in which nature sometimes works, not in violation of her laws, but in deviation, so to speak, of her most common habits. These remarkable structures are indeed revelations, the interpretation of which ought not to be neglected.

M. Moquin-Tandon, in his classification of vegetable monstrosities, forms a class in which the deviation of the specific type is connected with the form. These deviations are of two kinds: they are either changed from one organ into another, and then they constitute *metamorphoses*, or they are alterations which, being irregular, become *deformations*; or, being regular, constitute *Pelorias*.

M. Van Oyen's pelorias of the Calceolaria were produced by some garden varieties of corymbosa, crossed first by pendula, the resulting varieties subsequently intermingled. An analogous form of peloria was seen in 1833 by M. de Chamisso, in the Calceolaria rugosa, and later by Guillemin. The specimen of M. Van Oyen differs from these, chiefly by its great size, colour, and form: it forms the third example of the kind which has been recorded.

The Calccolaria is, as is known, a scrophulariaceous plant, having normally an equally divided four-parted calyx, and an hypogynous corolla formed of a very short tube, and a limb of two lips, the superior one short, truncated and rounded, entire; the inferior very large, prolonged in the form of a slipper, and concave. The flower is furnished with two stamens, inserted on the tube of the corolla, scarcely exserted; the anthers bilocular, the cells separate divaricate, one often sterile. The ovary is bilocular; the placentas multi-ovuled; the style simple, the stigmate pointed. Such is the type of the genuine flower. The following is a description of the peloria of Van Oyen;—Two flowers alike normal grew to the right and left of the summit of the floral branch. This summit was itself terminated by a pelorized flower which measured not half-an-inch long, like that of Guillemin, but nearly four inches. It was not, as may be seen from the figure, a dwarf monster. The ealyx was conformable to the normal flower. The corolla had the form of a Rhenish wine flask, much clongated, straight at both extremities, inflated at the middle, the part towards the summit being contracted like the neck of a bottle; the summit of the corolla itself was still further contracted, and tapered in the form of the mouthpiece of

\* From Fuchsia, ou Recueil d'Observations de Botanique, &c. Brussels. 1850.

a flute, where it split in two oval openings. The corolla, when opened, presented no trace of stamens, only the pistil of regular form was placed at its base, and had its style curved to one side. The colour is not less remarkable: on the ordinary flowers of this variety of Calceolaria, the base is straw-colour, and there is a red tinge visible at the inside, the internal cuticle being coloured red; the inferior lip is coloured with light red, but here it is the outer skin that is coloured. Now, in this monstrosity the base of the corolla presented at first a yellow zone; then a broad red band in the interior, proceeding from the coloured part of the internal skin; then came a zone of pure yellow, and at the con-

tracted part the outer skin was coloured with red; and at last the small narrow terminal beak was of a rich yellow.

The base of the bottle-shaped corolla, it therefore appears, represented the throat of the two-lipped normal corolla, and the conical end represented the inferior lip. The hypertrophy of the bottle-shaped corolla is evidently explained by the resorption of all the male organs. In the peloria of Guillemin, which only measured about half-an-inch, there was, however, also a complete absence of stamens. Is this absence the condition of the regularity of arrangement of the bilabiate flower of calceolarias? The three cases noticed would seem to establish this view. According to this state of things, this pelorisation would seem to be a disposition of parts in a regular form; for the Calceolaria, having the flower bilabiate and slippered, is irregular, and the bottle-shaped peloria is a regular form, with the exception of its extreme beak. Yet, if properly considered, the pelorisation is not a regular disposition of parts. Such an arrangement of a Calceolaria would consist of a central pistil, five stamens, a rotate corolla, with five lobes alternating with the stamens.

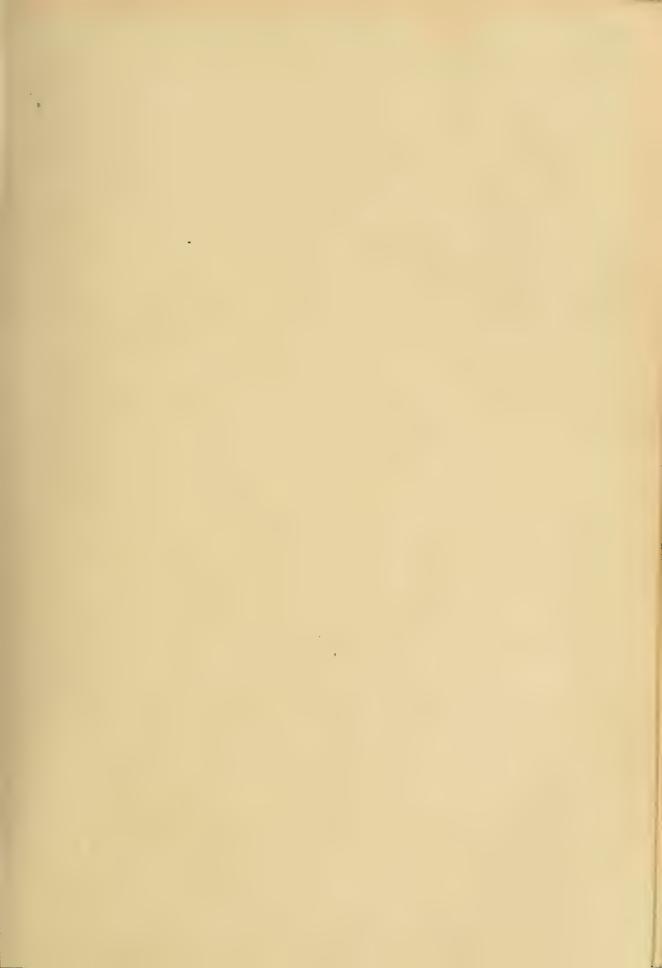
and a calyx with five teeth alternating with the corolla. Then the Calceolaria would pass from the family of scrophulariaceæ into that of solanaceæ, and the flower would realise its regular type, its native beauty—for it cannot be denied that beauty results from symmetry, and symmetry is a disposition founded on regularity, or a harmonious relation of numbers, parts, and form. It is a remarkable law of nature, that families that are irregular may return by these monstrous forms to their regular families; while we never see a regular flower realise the structure of an irregular one.

The peloria of Van Oyen does not show the Caleeolaria to return to the type of the solanaceæ, but descends still lower, and realises a still stranger form, and one which is opposed to nature—an anandrous form, consequently unfitted to perpetuate itself. In this respect it is a monster in the fullest sense of the term, but one full of

instruction.

Another monstrosity, also sent me by M. Van Oyen, consisted in a growing together of two corollas; this occurred along with normal regularity of the calyx. The corolla was bicalcei-

ferous, having three stamens all fertile, one of which was placed at the junction of the two inferior lips; the ovary is normally conformable, and the calceiform lip was furnished with a lobe turning inwards. This form of abnormal development has not yet been recorded in morphological works. It is, I believe, a true junction of flowers, complicated by the resorption of the totality of the superior lip, by the non-development of the double calyx, and the resorption of one of the four stamens which should have been developed. This morphological form may perhaps some day lead to the determination of the real cause of synanthous developments.





Engles Darwing

## BERBERIS DARWINII.

Nat. Order .- BERBERACE E.

GENERIC CHARACTER. - Berberis, Linnæus. - Calyx of seven or nine sepals, coloured, in two or three circles, deciduous. Corolla of six hypogynous petals opposite the interior sepals, clawed, with two glands at the base within. Stamens six, hypogynous, opposite the petals; filaments flattened; anthers extrorse, two-celled, the cells adnate, bursting by valves opening from the base to the summit. Ovary ovate, one-celled. Ovules two to eight, erect from the base, anatropous. Style terminal, very short; stigma peltate, umbilicate. Berry onecelled, with from one to eight seeds. Seeds erect oblong, with a crustaceous testa, hilum somewhat lateral, near the base .-Shrubs common in the temperate parts of Europe, Asia, and America; rare in tropical America. Sometimes having the primary leaves abortive, often changed into simple or divided spines; the secondary leaves collected into a bunch upon a very short axillary branch, shortly stalked, simple, entire or with

the margins ciliated or spiny: sometimes having the primary leaves properly developed, unequally pinnate, with two to seven leaflets, and a pair of very small caducous petiolar stipules; peduncles axillary, one or many-flowered, racemose; flowers yellow.—(Endlicher Gen. Plant. 4814).

DIV.I.—Berberis, Nuttall.—Primary leaves abortive, converted into spines; secondary leaves fascicled, simple. Glands evident at the base of the claws of the petals, filaments not toothed.

Berberis Darwini, *Hooker*,—Darwin's Berberry.—Younger branches reddish-pubescent; spines short, palmato-partite; leaves rigid, leathery, shining, wedge-shaped, three-toothed

at the apex, margins with few teeth, teeth and lobes spiny; racemes longer than the leaves; pedicels twice as long as the flowers, slender; berry (persistent with the style) flask-shaped.

-Hooker, Icones Plantarum, t. 672.

distinguished by the ferruginous pubescence of the young branches. The alternate fascicles of leaves are closely approximated, and arise from the axils of small, palmately-divided, woody, five-spined scales or abortive leaves. Leaves of the fascicles rigid and leathery, from three-fourths to half an inch long, somewhat wedge-shaped or more truly escutcheon-shaped, tapering down to a very short petiole, and divided at the abrupt upper end into three teeth, two marginal and the intermediate longer and triangular, all tipped with spines; the lower leaves have somewhat revolute margins, with two or three lateral spiny teeth, the upper ones without lateral teeth; upper surface deep green and shining, lower face pale with the veins evident. Inflorescence terminal on the upper fascicles, in full oblong racemes arising from a sessile, imbricated involucre of small concave lanceolate green scales. Peduncles elongated, and, like the pedicels, reddish. Pedicels arising from the axils of small acutely ovate concave bracts; elongated, twice or three times as long as the conspicuous flowers. Floral envelopes orange, the outer tinged with red. The berry apparently black with a glaucous tinge, flask-shaped in immature specimens.—A. H.

History, &c.—Messrs. Veitch and Son, of Exeter, have had the good fortune to raise and flower this charming shrub; one of the most beautiful we have for a long time had the good fortune to meet with. It has been found in Chiloe, in Patagonia, in Valdivia, and in Osorno; and its discoverers are Mr. Darwin, after whom it is named, Mr. Bridges, and Mr. Thomas Lobb, through whose instrumentality it has reached Mr. Veitch's hands. Mr. Lobb states, that when it becomes large, it is the finest species he has seen of the genus. Our drawing was made from a cut specimen exhibited by Messrs. Veitch at the meeting of the Horticultural Society on the 1st of April, and this was accompanied by a fine bush of about a yard in height and diameter, growing in a pot, and literally covered with blossoms. The colour is a very bright orange.

Culture.—With Mr. Veitch, Darwin's Berberry proves quite hardy. Whether the same result will be attained in less favoured localities, we are unable to say; but, either as a bush for the clump or the lawn, or as a tenant of the conservative wall, this fine evergreen must be had in every garden. It is a free growing plant, in good open soil, and no doubt, like most of its race, will propagate with facility. Touching its hardiness we find it remarked by Dr. Lindley, that it grows naturally near the summer limits of snow upon its native mountains.—M.

## THE GENERA AND SPECIES OF CULTIVATED FERNS.

By Mr. J. HOULSTON, ROYAL BOTANIC GARDEN, KEW; AND MR. T. MOORE, F.L.S., &c.

Sub-order-Polypodiacre: Tribe-Acrosticue v. Sect. I. (Continued),

GITENOCHLENA, J. Smith. (Aerostichi sp., of Linneus).—Name derived from stenos, narrow, and chlainer, a cloak; alluding to the narrow membranous margin of the fertile pinner.

Sori amorphous, densely covering the under surface of the fertile fronds. Veins (sterile) simple or forked, external. Pinnæ (or pinnules) linear, narrow, the margin membranous, revolute and industiform; venules parallel, there apieces exserted, forming cartilaginous serratures, or conniving and forming a thickened margin. Rachis like vot. 111.

のでき

Fronds pinnate, or bipinnate, from part of rhizome, sometimes producing abnormal tripinnatifid sterile fronds.

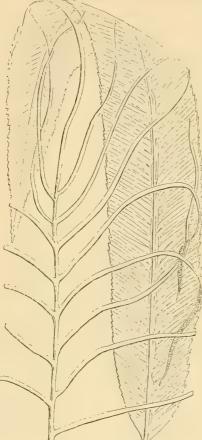
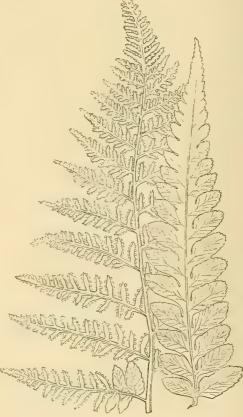


Fig. 23. six to eight inches long, pinnules linear, narrow, and sporangiferous on the under surface. Both forms are lateral, adherent to a slender green creeping rhizome, which is covered with long narrow scales, attached by 2. S. sorbifolia, J. Smith: Linnæus.—A dwarf, evergreen, scandent, stove Fern, from Jamaica. Sterile frond glabrous, pinnate, about a foot long, with ovate or oblong acuminate, undulated, coriaceous, shining, bright green pinnæ, which are cuneate at the base, and articulated with a winged rachis. Fertile frond erect, one foot high, pinnate, the pinnæ entire and articulate with the rachis. Both forms are lateral, adherent to a scaly

one to four feet long, glabrous or squamose. Rhizome creeping .- The species belonging to this genus have a very distinct and peculiar aspect, and form a very natural In habit they resemble Polybotrya, by having a creeping scaly rhizome; the linear narrow segments of the fertile frond, with their indusiform margins, are analogous to Lomaria, but they differ materially from that genus in the margin being revolute, whereas in Lomaria it is plane, and usually the axis of an indusium. Fig. 23 represents a pinna of the sterile frond, with part of a pinna of the fertile frond of S. scandens (med. size). \*

1. S. scandens, J. Smith: Linnæus.-An elegant evergreen stove fern, with a scandent habit, native of the East Indian and Malay Islands. Sterile frond glabrous, shining, pinnate, somewhat pendulous, from three to four feet long, the pinnæ linear-acuminate, cuneate at the base, rather membranous, nearly a foot long, with a serrated cartilaginous margin; veins simple or forked, parallel, connected at the base by arcuate costal veins, forming a row of long narrow areoles close to the midrib. Fertile frond bipinnate, pinnæ



OLYBOTRYA, *Humboldt*.—Named from *polys*, many, and *botrys*, a raceme; alluding to the appear-

ance of the fertile frond.

creeping rhizome.

Sori amorphous, occupying one or both sides of the spiciform segments of the contracted fertile frond. Voius pinnate; venules simple, free, external.

\* We are indebted to Mr. Henderson, gardener to Earl Fitzwilliam, of Wentworth House, Yorkshire, for numerous specimens from his collection of cultivated Ferns, and likewise for information concerning new and rare species not generally known in cultivation. The Stenochlæna scandens, although introduced about 1840, has not produced any fructification as far as we can learn except at Wentworth, where it has fructified at two different periods. Our figure was taken from a specimen kindly communicated by Mr. Henderson, as was likewise that of Polybotrya, but the latter has produced fructification at Kew.

bi-tripinnate. Rhizome creeping.—This genus appears difficult to distinguish from some already alluded to except by the form of the fertile frond. In habit and venation it is similar to many species of Stenochlæna, but is separated chiefly on account of the formation of the fertile fronds. From Elaphoglossum it is distinct

in habit, although somewhat analogous in venation; distinguishable, however, by the veins being external, those of Elaphoglossum being internal. There are many species belonging to the genus, all tropical, but only one is in cultivation. Fig. 24 represents a pinnule of the sterile frond, and the upper portion of the fertile frond, of *P. cylindrica*.

1. P. cylindrica, Kaulfuss.—A coarse-looking scandent evergreen stove fern, from Jamaica and South America. Sterile fronds glabrous bi-tripinnate, two to two and a half feet long; pinnules oblong-acuminate, somewhat cuneate at the base, bluntly lobed or dentate, bright green, and shining; stipes scaly. Fertile frond contracted, bi-tripinnate, erect; segments terete, sporangiferous throughout. Both forms are lateral, adherent to a creeping rough scaly rhizome. This species is found in its natural habitats, climbing to the height of twenty feet or upwards on the trunks of trees.

SECT. II.—Symplophlebicæ, J. Smith.—Veins netted.

LFERSIA, Raddi.—Name probably commemorative of Olfers, a German writer.

Sori amorphous, densely covering the segments of the fertile frond throughout. Veins forked, parallel,

> internal, their apices combined by a transverse continuous marginal vein. Fronds pinnate. Rhizome creeping. -This very elegant fern, the only species of the genus in cultivation, attains the height of two or three feet. consequence of the fertile frond being contracted, and sporangiferous on both sides, it does not admit of the venation being seen; but in the sterile frond the venation is evident, and indicates a decisive character, by which it is readily distinguished, namely, the continuous, marginal,

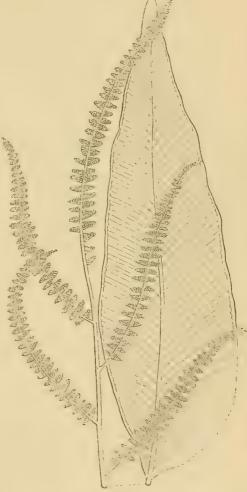


Fig. 25.

transverse vein, connecting all the oblique veins by their apices. Fig. 25 represents a pinna of the sterile frond, and a portion of the fertile frond of O. cervina (med. size).

1. O. cervina, Presl: (Polybotrya cervina, Hooker et Greville).—A very elegant evergreen stove fern, from the West Indies. Fertile fronds erect, bipinnate, from two to three feet long; pinnæ linear sporangiferous throughout, stipes covered with long narrow scales. Sterile fronds glabrous, pinnate, reclining, from two to three feet long with oblong-acuminate coriaceous bright green pinnæ, rounded at the superior base; the inferior truncate. The fronds are terminal, adherent to a scaly creeping rhizome. The fertile frond of this species is commonly bipinnate; when only pinnate it becomes the O. corcovadensis of Raddi, a so called Brazilian species, but as we have specimens of both fertile forms, gathered at the same time from one plant, it is obvious that they are only modifications of one species.

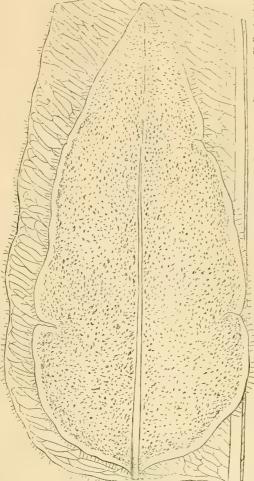
METIUM, Splitgerber (Aerostichi & Anetium, Kunze).—Name derived from anetos, lax; alluding to the sori being sparse and scattered.

Fig. 26. Spore cases few, and regularly scattered throughout the under surface of the fronds, often collected in small groups or lines. Venation uniform, reticulated; arcoles clongated. Fronds simple; raizome creeping.—The habit of this genus, (which contains but one species), and the few scattered sporangia,



are the characters by which it is separated from Acrostichum. The woodcut, fig. 26, represents a frond of A. citrifolium (med. size).

I. A. citrifolium, Splitgerber (Acrostichum citrifolium, Linnæus).— A dwarf ornamental evergreen stove fern



from the West Indies. Fronds simple, uniform, glabrous, somewhat membranous, oblong-elliptical, attenuated at the base, six to ten inches long; lateral, articulated with a scaly fibrous creeping rhizome. Sori irregularly scattered.

OICTYOGLOSSUM, J. Smith (Acrostichi sp. of Swartz).—Name derived from diktyon, a net, and glossa, a tongue; alluding to the reticulated venation, and the formation of the fertile fronds.

Sori amorphous, densely covering the under surface of the fertile frond. Venation uniform, internal, reticulated, forming large elongated areoles. Fronds simple, one foot or more in length, hairy. Rhizome creeping and densely covered with pair-like scales.—This genus is established on a solitary species, differing from Acrostichum in habit more than any other character; its nearest affinity is with Anetium, resembling it in habit, by having simple fronds, and a creeping rhizome, but separated by the amorphous sori; the sori in Anetium

Fig. 27.
being few and irregularly scattered, while in Dictyoglossum they densely cover the whole under surface, except the margin. Fig. 27 represents a portion of the sterile and a fertile frond of *D. crinitum* (less than half the nat. size).

1. D. erinitum, J. Smith. (Acrostichum crinitum, Swartz).—A singular evergreen stove species, with a very peculiar aspect, a native of Jamaica. Fertile fronds simple, erect, oval-elliptical, contracted, from twelve to fifteen inches high, with a stipes of six to nine inches, densely covered as well as the upper surface of the frond, with long, narrow black hair-like scales. Sterile fronds simple, oval-elliptical, coriaceous, twelve to fifteen inches long, and eight to ten inches wide, dull green, and hairy throughout. Both forms are terminal, adherent to a thick creeping rhizome, which is densely covered with criniform scales.

CROSTICHUM, Linnaus. Named from akros, high, and stichos, and order; the fructification occupying the upper portion of the firtile disk.

Fig. 28.

Sori amorphous, universal on the under surface of the fertile frond. Venation uniform, reticulated, forming elongated areoles.—The species belonging to this group are but few in number; all tropical; and varying in





height from six inches to eight feet. Only one representative of the genus is at present in cultivation. The technical characters by which the genus is distinguished are the uniform reticulated venation, and erect caudiciform rhizome. Fig. 28 represents a pinna of the sterile and fertile fronds of A. aureum (med. size).

1. A. aureum, Linnæus.—A noble evergreen glabrous stove fern, native of the West Indies, tropical America, and East Indian and Polynesian Islands. Fertile fronds contracted, erect, pinnate, from six to eight feet high, soriferous throughout, or two or three of the lower pairs of pinnæ sterile. Sterile frond pinnate, six to eight feet long, reclining, with lanceolate-acuminate rather membranous light green pinnæ, the lower ones petiolate, cuneate at the base, upper ones adnate at the inferior base, and decurrent. The fronds are terminal, adherent to an erect caudiciform rhizome.

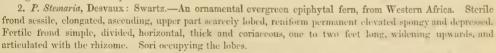
In the Magazine of Natural History (1838, p. 453) are some observations on this species by R. Heward, Esq., F.L.S.: -- "This noble fern is very plentiful in morasses and water-courses in the lowlands of Jamaica. It

grows from eight to ten feet in height. I never found it at any great elevation above the sea shore." In cultivation, it requires a mixture of turfy loam and sand, abundance of water, and a heat of 85° or 90° Fahrenheit, when it will form a splendid

DLATYCERIUM, Desvaux (Acrostichi, sp. Swartz).—Named from platys, broad, and keras, a horn; the fertile fronds resembling broad horns, as those of the elk.

Sori without any defined form, produced in irregular patches towards the extremities of the fertile fronds, or on a special lateral thickened lobe, the sporangiferous receptacle being formed of an accessory layer of parallel anastomosing veinlets, which cross the sterile ones, and produce crowded linear lines of spore-cases. Veins repeatedly forked, and distantly anastomosing; venules internal, compoundly reticulated, with variously directed free veinlets, terminating in the areoles. Fronds simple, forked, coriaceous, thick and spongy; the sterile sessile, rounded or elongated, uniform, depressed or ascending, sublobate, permanent and successively imbricated, forming an elevated spongy mass; the fertile widening upwards, and dividing into broad forked segments. - The few species contained in this genus have an epiphytal habit, and produce their fertile fronds annually; these are attached by an articulation, and when mature fall spontaneously, the persistent depressed alternate sterile ones then having the appearance of a lichen or fungus. The generic name is in this case very expressive, the fertile fronds having a striking resemblance to broad flat horns. In the absence of fructification, the genus is readily known by a stellate pubescence that covers the whole surface. Fig. 29 represents a portion of the fertile frond of P. alcicorne (med. size).

1. P. alcicorne, Desvaux: Swartz.—A very singular epiphytal fern, a native of New Holland, requiring to be cultivated in an "intermediate" house. Sterile frond sessile, round or clongated, the upper portion sublobate, permanent, elevated, spongy, reniform, and depressed. Fertile frond simple, divided, horizontal or oblique, thick and coriaceous, twelve to fifteen inches long, widening upwards, white on the under surface, and articulated on a short slightly creeping rhizome. Sori amorphous in patches, occupying the lobes or extremities of the frond, which is densely covered throughout with a stellate pubescence.



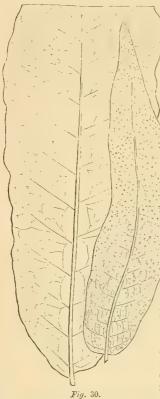
3. P. grande, J. Smith (Acrostichum grande, Allan Cunningham).—One of the most singular of all ferns. An epiphytal evergreen stove species, a native of New Holland and the Malayan Islands. Sterile frond sessile, reniform, round or elongated, ascending, two to two and a half feet high, the upper portion dividing into many broad blunt segments, permanent, elevated, spongy, and depressed. Fertile frond simple, two to three times divided, horizontal and pendulous, thick and coriaceous, two and a half or three feet long, widening upwards, articulated on a short rhizome. Sori in a large triangular patch adjacent to the sinus of the first division. Fronds covered throughout with a stellate pubescence.



Fig. 29,

ANTOGONIUM, J. Smith (Acrostichi sp. of Authors).—Named from kyrtos, curved, and gonu, the knee; in allusion to the peculiar knee-bent curve of the venules.

Sori amorphous, universal on the under side of the contracted fertile fronds, or sometimes crowded on the



venules. Veins pinnate; venules arcuately or angularly anastomosing, producing from their exterior sides or angles of meeting, one or more excurrent free or irregularly anastomosing veinlets. Fronds pinnate, from one to two feet long. Rhizome creeping.—The aspect of the species placed in this group of Acrosticheæ varies but little from that of the subsequent genus; the principal distinguishing character is their more simple anastomosing venation. Fig. 30 represents a pinna of the sterile and fertile fronds of *C. flaqelliferum* (nat. size).

1. C. flagelliferum, J. Smith: Wallich.—A proliferous, free-growing, evergreen stove fern, from the East Indies. Fertile frond contracted, erect, pinnate, from one to one and a half foot high; pinnæ oblong-acuminate, petiolate, the terminal one narrow and elongate. Sterile frond glabrous, rather membranous, pinnate, from one and a half to two and a half feeet long; pinnæ petiolate, ovate or oblong-acuminate, undulated, the terminal one a foot or more long, narrowing upwards, and proliferous near the apex. Both forms are lateral, adherent to a creeping rhizome.

2. C. repandum, J. H.: Blume.—A glabrous evergreen stove fern, from the East Indies. Sterile frond slender, reclining, pinnate, one and a half to two feet long, membranous, bright green; pinnæ proliferous, repand, ovate-acuminate, petiolate, deeply crenate or slightly lobed, undulated, the terminal one sinuose, elongate. Fertile frond erect, pinnate; pinnæ oblong-acuminate, and petiolate; stipes with a few scattered scales. Both forms are lateral adherent to a creening

few scattered scales. Both forms are lateral, adherent to a creeping rhizome. This species has been recently introduced by Messrs. Rol-

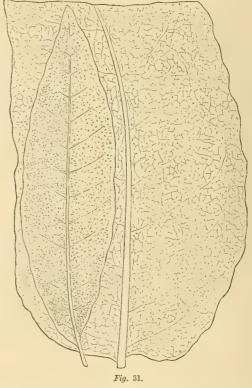
lisson of Tooting, from Java.

3. C. crispatulum, J. H.: Wallich.— A very handsome evergreen stove fern, from Ceylon. Frondsrathererect

lanceolate-acuminate, one to two feet long, pinnate, deep green, with linear-acuminate petiolate, glabrous, undulated pinnæ, having the margin crenate, with a row of spinulose teeth, one to each marginal sinus. Fertile frond erect, pinnate, one foot high; pinnæ narrow, and petiolate. Both forms are lateral, the stipes scaly, adherent to a creeping scaly rhizome.

(Acrostichi sp. of Authors).—Named from gymnos, naked, and pteris, a fern; alluding to the exposed fertile fronds.

Sori amorphous, densely covering some portion, or the whole of the fertile pinnæ. Veins pinnate; venules compoundly anastomosing, producing variously directed straight or curved free veinlets, terminating in the areoles. Fronds simple or pinnate, from one to three feet long. Rhizome creeping.—The species arranged under this genus agree in habit with Cyrtogonium, but are distinguished by the more irregular and compound anastomosing of the venules. The genus contains ten or twelve species, but only two are at present in cultivation. Fig. 31 represents a portion of the sterile frond, and a pinna of the fertile frond, of G. nicotianæfolia (med. size).



1. G. nicotianæfolia, Presl: Swartz.—An ornamental evergreen stove fern, from the West Indies. Fertile frond erect, pinnate, or bipinnate below, one to two feet high; pinnæ oblong-ovate, lower ones petiolate, upper ones

adnate, stipes covered with narrow scales. Sterile frond glabrous, pinnate, one to two and a half feet long, bright green, and shining; pinnæ large, rather membranous, oblong-acuminate, undulated, lower ones petiolate, and roundish at the base, upper ones adnate-decurrent. Stipes scaly near the base. Both forms are lateral, adherent to a creeping rhizome.

2. G. decurrens, J. Smith (Leptochilus decurrens, Blume).—A singular evergreen stove fern, from Ceylon. Sterile frond simple, glabrous, a foot long, lanceolate-acuminate, attenuated at the base, pale green, and slightly undulated. Fertile frond simple, slender, linear, very narrow, one to two feet long, and one eighth of an inch broad; stipes one half the length of the frond. Sori linear, continuous, forming a row on each marcin. Both forms are lateral, articulated, on a slender creeping rhizome.

# Socred Botong. - The Cereals.

MHE Cereals are of earlier origin than man himself, as we learn from the recital of the six days' work of creation. Those which are mentioned in the Bible, as far as they can be ascertained, are Wheat, Barley, and Millet, and to which we ought to add the "Tares" of the parable. Oats and probably Rye were unknown to the Hebrews; and the supposed reference to Rice is open to much doubt.

Wheat, by far the most important of these grains, is mentioned in passages too numerous to cite. It is given in our version as the translation of the Hebrew chittah, and much learned argument has been elicited, to prove that this is a correct translation. It has been thought by some, that the word "corn," in our version, should be also taken to mean "Wheat," but this seems a forced conclusion. for even though bread-corn be in all cases implied, it is certain that barley bread was made use of almost as far back as the patriarchal age. The ancients cultivated different kinds of Wheat, and we have no certain means of identifying that referred to in the scriptures. Varieties of the common Wheat, Triticum æstivum and hibernum, have been cultivated in Syria, and the T. compositum, in Egypt; the latter, commonly called seven-eared Wheat, is supposed, with good reason, to be the plant indicated in the dream of the Egyptian king: "I saw, and behold seven ears came up in one stalk, full and good." (Gen., xli. 22). The earliest distinct mention of Wheat occurs in the days of the patriarch Jacob: "Reuben went in the days of Wheat harvest, and found mandrakes in the field." (Gen., xxx., 14). It is not, however, improbable, that it is implied among "the fruits of the ground" brought as an offering by Cain, (Gen., iv. 3); and still more probably, in the case of Isaac, who "sowed" in the land of Gerar, and "received in the same year a hundred-fold," (Gen., xxvi. 12).

Rye is mentioned in our version on the occasion of the plague of hail in Egypt, when, though the Flax and the Barley were smitten, the Wheat and "Rie" escaped. The word translated Rie, is kussemeth, which is elsewhere rendered "fitches," (see Exod., ix., 32; Isaiah, xxviii., 25; Ezek., iv. 9). What it signifies is doubtful, but that it was a cultivated grain, and an article of diet, are obvious from the passages just referred to. It does not appear to be Rye, which is a grain of cold countries, and not cultivated even in the South of Europe. The most probable suggestion is that it means Spelt or Spelt wheat, Triticum spelta, a species in many respects resembling our common Wheats, and long thought, though apparently without good foundation, to have been the original stock from whence they sprang. The "fitches" of the passage in Isaiah (ketzuch, kesach, or ketsah), are most probably the Black-seed, or Nigella sativa, a black aromatic seed, daily employed as a condiment in the East.

Barley is very early mentioned as being grown in Egypt, the Flax and the "Barley," which latter, "was in the ear," being smitten by the plague of hail, (Exod., ix. 31). Frequent allusion is subsequently made to it as being cultivated and used in Palestine, and it is sometimes expressly spoken of as fodder; which latter, indeed, is still its chief use in Western Asia. We first read of bread made of Barley in the days of the Judges, (ch. vii., 13), when a loaf of Barley bread formed an ominous feature in the dream of a soldier of the Midianitish host. Many centuries later a few "Barley loaves" were miraculously made to feed a great multitude, and elicited from His lips, "who spake as never man spake," the golden advice: "Gather up the fragments that remain, that nothing be lost," (John, vi. 12).

The prophet Isaiah makes use of a figure which has been supposed to refer to the culture of Rice: "Blessed are ye that sow beside all waters, that send forth thither the feet of the ox and the ass," (Isaiah, xxxii. 20); and the wise man's expression, "Cast thy bread upon the waters," (Eccles. xi., 1), has been supposed to bear a similar meaning. Dr. Royle, however, thinks it exceedingly precarious to build so important a conclusion, as that Rice had been so early introduced into the Levant, upon such slight indications; the more especially as it now appears that Barley is in some parts subjected to the same process of submersion as Rice, as Major Skinner particularly observed near Damaseus. In Palestine two crops of Barley were generally sown, one in the autumn, in which case the harvest was ready about the Passover.—and the other early in spring.

Millet is one of the ingredients of which the prophet Ezekiel was to compound his mixed or typical "bread," (Ezek., iv. 9), but is not elsewhere mentioned in the Bible. Millet is one of the smaller grains commonly cultivated in the East, and is chiefly the produce of Panicum miliaceum, a tall reedlike grass, bearing a large drooping panicle of small, smooth, oval seeds. Being so universally cultivated in the East, there seems little doubt of it being the plant mentioned by the prophet, though Holcus Sorghum, another large Millet-bearing grass, is preferred by some writers.

Properly classed with the Cereals, are the "Tares" of the parable, by which, no doubt, is intended the Darnel or Lolium temulentum, a large-seeded grass occurring in cornfields, and producing deleterious grain. It will be recollected that, according to the parable, (Matt., xiii., 25). the husbandman "sowed good seed in his field, but while men slept, his enemy came and sowed Tares among the Wheat;" and only "when the blade was sprung up and brought forth fruit, then appeared the Tares also." The Tares must therefore have been one of the family of grasses, or they would have been recognized as weeds at an earlier stage. This deleterious darnel has a name in Arabic, zawan or ziwan, much resembling that of zizanion, by which the "Tares" are mentioned in the passage quoted; and we learn from Volney, that the peasants of Palestine and Syria do not always remove the seeds of weeds from their corn, and so sometimes leave the zivan, which, when eaten, stuns people and makes them giddy. In our own country the most alarming results have sometimes ensued, from the seeds of the Darnel being carelessly ground up with the Wheat used for food. Dr. Kitto states that in certain parts of Syria, the plant is drawn up by hand at harvest-time, and then separated from the Wheat and bound in bundles—a fact which may be taken to corroborate the view that Darnel is intended, for the command was, "let both grow together till the harvest, and in time of harvest, I will say to the reapers, gather ye together first the tares, and bind them in bundles to burn." We conclude by citing some passages from a paper on the Scripture History of Cereals, by Dr. Manz, of Eslingen, read before the Royal Academy of Belgium, for which we are indebted to Professor

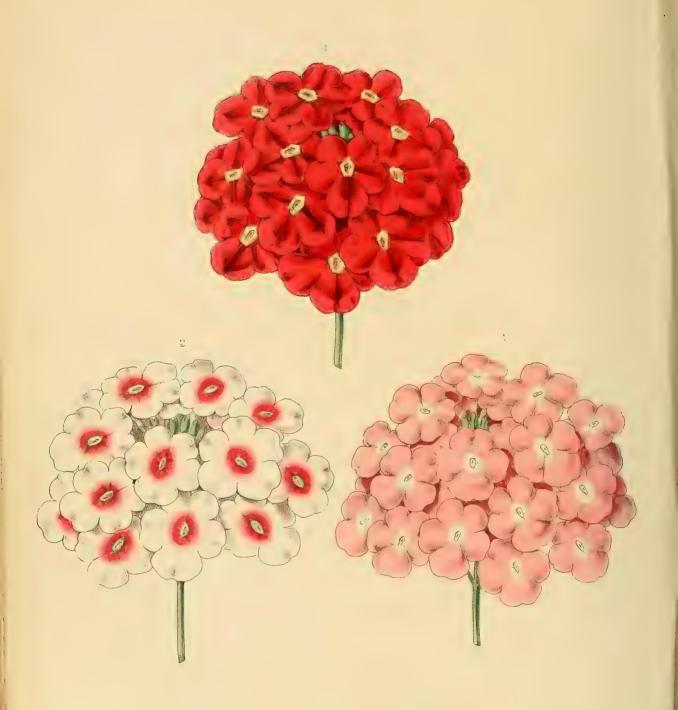
"The return of a hundred-fold which Isaac received from his sowing was, at that period, by no means extraordinary. We see this by the statements of old authors. Herodotus affirms that the fruits of Ceres in Assyria amounted to two or three hundred times the quantity of seed sown. In respect to the fertility of soil, the suburbs of Alexandria, in Egypt, were still more remarkable, since the bread cereal par excellence (wheat) yielded five hundred and a thousand per cent. Millet is also cited because of its enormous productiveness; and it was doubtless the ordinary aliment of the poor people in Arabia, as it is still in the suburbs of Tripoli. Russegger relates, that 'in lower Egypt there are twenty sorts of Cereals and leguminose plants, including all our Europæan Cereals, which succeed admirably, and produce, at least, a hundred per cent. of seed, from the circumstances under which their culture is pursued, being of the most favourable description.' It is somewhat singular that in the Bible we have no certain mention of two Cereals so common in our own day, namely, Oats and Rye. As for the Oat it was probably neglected, from the perfection to which the other Cereals were grown. It may, however, have been confounded with the grasses, without obtaining a special name; and we should perhaps thus understand Oats, properly so called, as intended when grass for cattle is spoken of (Psalm, civ., 14); or they may be meant when grass as fodder is mentioned, (Psalm, evi., 20); or, in short, grass that grew, en pasture, on the mountains; since, according to all geographical botanists, Asia is certainly the native country of the Oat.

"With regard to Rye, we find it cited in the Lutheran translation; but it is not admitted by all, and no doubt the translation is questionable. Some commentators are of opinion that a sort of Wheat is meant here. Although we have not found from the scriptures that Rye existed in Palestine at so early a period, botanical travellers have mentioned this Cereal as being spontaneous in the country. Schubert says that the Cereals grow spontaneously, and in great quantity in many parts of the Holy Land, and especially in the Plain of Jesse, and on the heights of Galilee; they appear there as vestiges of old fields once cultivated, attesting still to the great fertility of ancient Palestine. Wheat and Barley are thus found growing spontaneously, and amongst them our common Rye, which, according to the testimony of Russegger, should belong, like the other Cereals, to Egypt.

"In general, no one disputes the fact that the native country of the Cereals of which bread is made is decidedly Asia. As Theoprastus informs us, Barley grew in a wild state on the mountains behind the Caspian sea (Western Asia); and Heinzelmann found corn in a spontaneous state in 'Bouschkirie.' It may certainly be admitted that the Cereals, from whose seed bread may be made, have journeyed conjointly with the augmentation and emigration of the human race over the globe, and

have thus arrived among ourselves."—M.





67 Rounde que 8 Tens

Verbenas

Fronted by GF Ghoffond London

1 Shylock, 2 British (Jucen 3 Exquisite.

#### NEW SEEDLING VERBENAS.

Nat. Order .- VERBENACELE.

Generic Character.—Verbena, Linnaus.—Calyr tubular, four- or five-toothed. Corolla hypogynous; tube cylindrical, straight or incurved; limb five-toothed, more or less unequal. Stamens four, inserted on the tube of the corolla, included, didynamous, all fertile, or the upper two without anthers. Ovary two- or four-celled, cells with one ovule; style terminal; stigma sub-capitate. Drupe dry, two-celled and separable into two parts, or four-celled and separable into four parts. Seeds solitary in the cells. Embryo exalbuminous; radicle inferior.—Herbs or under-shrubs, distributed throughout the warmer and temperate regions all over the world, most abundant in South America, rarest in Central Asia; erect, procumbent or ascending; leaves opposite, rigid, often serrate or incised,

spikes axillary or terminal, solitary, glomerate or paniculate; flowers sessile, bracteate, of various colours.—(Endlicher Gen. Plant. 3635.)

The Verbenas, like many other races of florists' flowers, have been so much intermingled by cross-breeding, that the traces of their parentage are effaced. Many of the stronggrowing varieties now in cultivation, doubtless, however, owe their origin to *V. teucrioides*.

FLORISTS' VARIETIES :-

- 1. Shylock.
- 2. British Queen.
- 3. Exquisite.

Varieties, and were raised by Mr. George Smith, of the Tollington Nursery, Hornsey-road, who is certainly one of the most enthusiastic and fortunate raisers of this splendid and useful tribe of plants. They are remarkable for large size, good substance, fine form, and excellent habit; and we have no doubt will be regarded as great acquisitions by all who cultivate them. To Shylock, it is impossible for us to do justice as to colour; it is a bright heavy scarlet, not brilliant, but nevertheless a very telling colour in the parterre, and is, without doubt, the finest formed verbena in cultivation; the large clear yellow eye makes it very remarkable. Queen of England is well represented, the bright eye being very conspicuous. Exquisite is an improvement upon Woodcock's Magnificent, being purer in colour, of better substance, finer in form, and much superior in habit. These and several more which Mr. Smith is sending out this spring, should be grown by every person who wishes to keep pace with the times. We saw the kinds growing last summer, and therefore know them to be worthy of commendation. It is unnecessary for us to offer any remark upon the cultivation of the Verbena, and we therefore append Mr. Glenny's criterion of perfection in the Verbena as a florists' flower:—

This favourite bedding plant, of which the most conspicuous and useful variety was once V. Melindres, has become a florists' flower; and, according to the authority now always quoted, Melindres is altogether in the shade. It has, it is true, a brilliant searlet hue, but the divisions of the flower are narrow and deeply notehed. The Properties of Flowers dictate, however strange it may have seemed at first, that the flowers shall be round; the petals thick, and free from notch; the colour dense, whatever shade it may be; the bloom abundant; the habit dwarf; the trusses large; and the flowers edge to edge. The wider, therefore, the segments and lobes of the flowers become, the nearer they approach perfection; and we do not despair of seeing the model very nearly attained. It is, however, desirable that the outer flowers of a truss should remain perfect until the inner ones are bloomed; and varieties of good substance will do this.—A.

## Carden Dints for Amateurs.

MAY.

FTER the middle of the month, gardeners will be busy transferring their plants to their summer quarters in the flower garden; but as greatest haste in such matters is frequently least speed, I should advise all but those very favourably situated to pause ere they commence operations too early, and until the plants are thoroughly hardened; as after the middle of May we have frequently severe frosts, which do very great injury to tender plants. Of course, the arrangement as to what the beds are to be planted with, was made last autumn, and all the plants necessary have been prepared. If not, no time must now be lost, and every endeavour must be made to get the plants strong and healthy. We have had some inquiries about the Mr. Beaton's shot silk beds, and we believe we are correct in stating that he used the gold-edged variegated Pelargonium and the Verbena venosa, intermixed, and not the common variegated, and hence those who use the common kind are very likely to be disappointed, inasmuch as the contrast of white and green will be very different to deep yellow and green, with the purple of the Verbena. We have not seen a bed of this kind; but we can readily understand

that the contrast must be very striking. As a white bed, Mr. B. recommends Campanula carpatica alba very strongly, and it is unquestionably an excellent thing; but we are not quite sure that the best variety of the double Matricaria is not equally good, and much more durable—at least, we do not wish to see a finer bed than we had last season. The old Campanula carpatica is a splendid plant, especially as seen in the gardens of the Duchess of Bedford and Lord Holland, at Kensington, where it forms one of the finest blue purple beds that could be desired, and, by removing the old blooms, flowers throughout the season. This plant, mixed with a dwarf bronzy Calceolaria, would form as fine a shot silk bed as the plant recommended by Mr. Beaton. At any rate, they are worth a trial. The system of edging beds of one colour with its complementary colour is much to be commended, not only as enriching the colours by contrast, but also as affording greater variety, and allowing the use of cold colours upon grass, where, without contrast, they are comparatively ineffective. Before planting out, if the beds are not rich, it will be well with some of the weaker-growing Verbenas to work in a good dressing of manure or rich compost, for without this and manure-water in dry weather it is impossible to get some of the more delicate and free-blooming kinds to bloom throughout the season. Some of the Petunias are also improved by the same treatment. The double deep scarlet Nasturtium forms a fine bed, but that requires a poor soil, or it runs too much to foliage; and where the soil is not naturally poor, a few barrow-loads of stones or gravel dug into it will do good. Beds or borders that are to remain vacant until the planting of the summer plants will be much improved by being forked over, especially in the evenings of warm days, as by that means a considerable quantity of heat may be worked in, which must be of great benefit to the plants when turned out. Remove bulbs, and other spring plants, as fast as they go out of bloom, and take care to harden the plants properly before turning out. Meteorologists tell us that we are to have a wet summer, the evidence in favour of such an event being as nine to one; and if such is the case, stimulating composts will not be required.

Look to herbaceous borders, thin and regulate the young growths, and stake the plants in time. Some of the new Phloxes and Antirrhinums are very beautiful, especially in the autumn; but we are sorry to say, our Continental friends have manufactured many varieties which we should gladly have been without. Prepare ground for planting out Hollyhocks, Dahlias, and other florists' flowers; look to beds of Pinks and Pansies; and, if not already done, complete the potting or planting out of Carnations and Picotees without delay. Tulips are advancing rapidly; therefore guard against storms and rough winds by timely covering. Generally, Tulips look well this season, and give promise of a fine bloom. Attend to Auriculas and Polyanthuses, as they go out of bloom, and do not forget that Ranunculuses require plenty of water and manure to grow them to perfection.

In the Rose garden much attention will be required, for the "worm i' the bud" will commence its ravages almost before the plants commence growth. Plant out the Tea, Bourbon, and other tender kinds, recollecting that Rose borders cannot be too rich or too deeply trenched. The old beds of these kinds must also be regulated and pegged down; for, after all, the pegging down system is the most effective for bedding purposes. The demand for Roses for bedding this season has been very large—indeed, of some of the finer kinds, it has been impossible to get sufficient stock in the nurseries. Specimen plants of Conifers, or other hardy shrubs or trees in pots, must now be planted out without delay, and recollect that a few extra barrow or cart loads of soil now to each plant will be duly compensated for by superior growth within the next four years. No labour is so well expended as in giving abundance of good material to good plants at the time of planting. Among new plants, Messrs. Veitch's Escallonia macrantha and Berberis Darwinii, figured on a preceding page, promise to become two of the finest evergreens in cultivation. Both are plants of remarkably free growth, and both are exquisitely beautiful. Messrs. Standish and Noble's list also contains a number of admirable things, more especially among the larger shrubs and trees.

American plants are advancing rapidly towards the blooming state, and most of the finer kinds promise to be unusually fine. The two rival exhibitions this season, by the great Bagshot growers at Chiswick and the Regent's Park, will afford some of our American friends the means of seeing them in greater perfection than they can see them in their native wilds. The Rose garden at the Regent's Park, if the plants do but succeed, and we think they will, will be a fine feature.

In the *In-door* departments the season has arrived when the plants may have more room, as no more plants for forcing need be introduced, and many of the more hardy shrubs, and other greenhouse plants may be removed to a sheltered place in the open air. This will afford the means of rearranging the entire collection, and care must be taken to allow each plant sufficient space to show itself, and to grow without restriction. Hard wooded and soft wooded plants may now be intermixed: indeed, the houses will now assume more the appearance of conservatories than what they really are. Azaleas coming into bloom must be assisted with manure water, and young stock of the same must be

duly encouraged. If the young growth is of sufficient length stop the plants at once, so as to get the second growth in good time to ensure its setting flower buds, and old plants as they go out of bloom should be introduced into heat to make their new growth, for most of the finer kinds, if they do not make an early growth, it is impossible to get them to flower with any certainty. Some of the more forward of the Camellias will be forming their flower buds; such, unless they are wanted to flower in August or September, should be removed to a cooler place, but be cautious that you do not expose them suddenly to the full glow of sunlight. Young stock, both in the stove and greenhouse, will be growing vigorously: attend to timely shifting, and as light is nearly at its maximum, make the most of it, by affording the plants every encouragement. Water copiously, when the plants require it, using weak liquid manure occasionally, and keep a lively growing temperature, and the atmosphere abundantly supplied with moisture. No plants are more grateful for good treatment than the softwooded stove things, such as Clerodendrons, Dipladenias, &c.; with a nice bottom and a brisk and moist growing temperature, the progress they make in a few days is most remarkable and gratifying. Heaths and greenhouse plants, at this season, also grow more rapidly than in the hot weather of sum-Shade them slightly in very bright sunshine, and keep a nice sweet, healthy, and moist atmosphere around them. Attend to timely stopping of the young growth, and repot any plants that may require it. Soft-wooded plants, as Pelargoniums, Calceolarias, and the like, will require plenty of air, and they must never know the want of water; give liquid manure once or twice a week, especially to those kinds whose pots are full of roots; and thin tie and regulate the growth of the successional stock. The first stock of these plants will be advancing rapidly into bloom, therefore shade them when necessary, and guard against bees by netting the houses with fine netting. The hybridiser and cross-breeder will now find abundant occupation, his flowers will require daily attention; and if he does not guard against the bees, his labour may be lost. Ventilate the houses freely, both night and day, but especially early in the morning, so as to allow the confined air to pass off freely, and without condensing upon the plants. Those who grow grapes in the greenhouse will require to attend to their vines by removing superfluous shoots, and by stopping the young growth one joint above the fruit. Plants in pits will require the usual attention, and a good batch of Achimenes, Gloxinias, Gesneras, Cockscombs, Balsams, Globe Amaranthuses, &c., &c., started now, and grown on in pits or frames will be found exceedingly useful by and by. Sow a little Cineraria, Primula, Humea, and such like plants, and encourage previous sowings.

In the Forcing Garden the Cucumbers will be in full bearing, and the Melons swelling their fruits. Plant successional crops, and sow another pinch or two of seed for the last crops. Remove litter from Scakale, Rhubarb, &c., fork the ground over, and give the first a good dressing of salt, and the Rhubarb some manure water. Make a mushroom bed in a cold corner, and for the chance of a crop. Prick out celery, attend to Basil, Marjoram, &c., and plant out Tomatoes when sufficiently hardened.

In the Open Garden wall-trees will require the first attention, by timely disbudding and regulating the crop so as to ensure its setting and stoning properly. So far appearances are in favour of a good crop of fruit this season, though the heavy rains in March were anything but favourable to Apricots and other stone fruits. Keep a look out for insects, and apply the usual remedies in good time. Vines on walls will also require attention, and the Gooseberry caterpillars must also be destroyed in time. Give strawberries a good soaking of liquid manure the first time they are dry, and then mulch them with clean straw or long grass immediately. Seedling Alpine Strawberries, for a late crop, must also be planted out in rich ground; and those that have been forced, if planted out now, will probably give another crop in the autumn. Get in successional crops of Peas, Beans, French and Runner Beans, Spinach, Radishes, Lettuce and other salad plants; also, small sowings of Cauliflower and Cape Brocoli, Cabbage, Savoys, Turnips, &c. Attend to those crops in a growing state, and directly a piece of ground is vacant, manure, trench, and plant another crop. Cucumbers and Vegetable Marrows must also be planted out when the ridges are ready.

Those routine operations of mowing, sweeping, hoeing, raking, &c., we say nothing about, as we suppose every person to understand when they ought to be attended to.

#### PLANTS AND PLANT JUDGING.

AS the season is fast advancing when judgment in plant management, so as to decide the skill of competing cultivators, will be required, a few suggestions on the principles which ought to guide censors, may not be out of place, and if observed, may prevent some of those who have not studied the subject from perpetrating such errors as unfortunately they are too much accustomed to fall into. The object of most horticultural societies is to encourage skill in cultivation, or, in other words, to reward

the best gardener, and whether that skill be exemplified in the production of a perfect plant, or a perfect flower, or set of flowers, matters little, so long as the skill is apparent; though it must never be



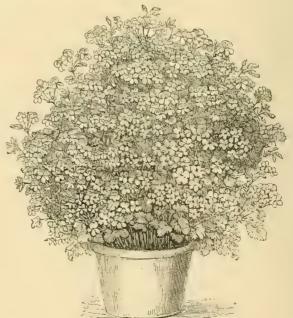
CHOROZEMA CORDATA.

denied that to produce a plant perfect in all its parts, from the origin of its first leaf to the perfection of its flowers, is a much more meritorious achievement than to show a single flower, however fine or perfect, when that flower has been produced by concentrating the entire strength of a plant, and by depriving it of some ten or fifty flowers, which the plant, if allowed, would have perfected. Hence floriculture, in so far as the production of cut flowers is concerned, is an inferior pursuit, neither so commendable nor yet so elevating in its influence upon the mind as the cultivation of the perfect plant, alike remarkable for its rude health, and the perfection and profusion of its floral embellishments. Who that has noticed the magnificent display of Roses in pots at the metropolitan exhibitions, could admire the cut specimens of the same thing, and who can doubt that when such men as Mr. Turner, and Mr. Bragg of Slough, bring their experience and intelligence to bear upon Carnations and Picotees in pots, they will produce

an equally creditable display? English gardening and enthusiasm is too far advanced to be trammeled by mere conventional rules or practices, and one might as well think of staying the currents of the tide as of diverting a florist's attention when anything great, or to promote the objects of his ambition

is to be achieved. Hence we believe that the showing of cut flowers will soon be numbered among "the things that were," and that nearly the whole of the florists' flowers will be shown in pots.

The object, however, of our present remarks is not so much to draw attention to florists' flowers as to offer a few observations upon plant-showing generally, and to point out what we consider ought to be the guiding principles in awarding prizes. In judging plants, various things must be taken into consideration, not only the health and general appearance of a specimen, but also the excellence of individual perfections, qualities which appear insignificant when considered separately, but which when viewed collectively, constitute perfection. Thus, supposing a plant had been beautifully grown, was of fine form, had short jointed wood and clean and healthy foliage, but had flowers in insufficient quantity, ill-formed or badly-coloured, or flowers insufficiently above the foliage, or with unusually long



FANCY PELARGONIUM.

foot stalks,—these would be great defects, inasmuch as flowers being the aim and end of the cultivator, and the main object of attraction, it is indispensable that they be of the finest and most perfect form and colour. However fine a plant may be, if it is deficient in flower, or the bloom is of bad quality,

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it is a defect, and in like proportion if a plant is ill-formed or has bad foliage, that also is a defect; but if a plant is unhealthy, that is a decided disqualification, for as prizes are offered to reward skilful cultivation, if the exhibition shows the want of skill, that is a disqualifying point. A plant to be perfect must be of symmetrical form, be short-jointed, and furnished with robust and healthy foliage from the base upwards. The form should not be formal, neither should the plants bear a rough and uncultivated appearance, but it must be graceful and easy in character, and while it bears the impress of art, must be sufficiently removed from formality to have some of the easy grace of nature about it. The bloom must be large and profusely produced, brilliant in colour, finely formed, and if scented rich in odour. At the time the plant is shown, sufficient bloom to present a uniform head should be expanded, and it should have a rich, crisp, and glossy appearance. Cleanliness is a great point; consequently every leaf must be free from dirt of any kind, and not an insect must be seen. Plants thus appointed, whether they be hard or soft wooded, come from the tropics or be denizens of a milder climate, will always please; and it matters not whether they be large or small, they all alike show the skill of the gardener—so long as they are sufficiently large to show some mark of cultivation since they left the nurseryman's stores.

As, however, example is generally better than precept, we reproduce from our first volume two examples of good management—one a Chorozema cordata grown in the Royal Botanic Garden, Kew, and the other a Fancy Pelargonium, as shown by Mr. Robinson of Pimlico. These may be regarded as perfect specimens of their kinds, are symmetrical in form without being formal, and graceful in outline without being encumbered with numerous sticks. It must, however, be remembered, that a plant may be large and finely formed, and yet not meritorious in point of management, for it may be a plant of very easy cultivation; for instance, the Chorozema, though admirable in its way, would not bear comparison with a plant of C. triangularis, angustifolia, or Henchmanni, of the same or even smaller size, while a plant of Burtonia conferta or violacea, Boronia serrulata or pinnata, or Gompholobium splendens, not half the size, would be infinitely superior and more meritorious. Hence it is necessary that censors should be persons of experience, and practically acquainted with the management of the plants they undertake to adjudicate upon.

Plants also should harmonize in point of size, so that when grouped together they may look as if they came from the same place, and not as if they had fallen together by chance. We once saw a collection of splendid Heaths, averaging from two to four feet in size, lose the first prize through the gardener putting in a small but admirable plant of Erica Sprengelii; and only last year we saw Cytisus racemosus, five feet high, and Hoyabella, about as many inches, shown in the same group. Such arrangements show bad taste, and ought to be publicly reprobated. It may, perhaps, so happen, that several collections of plants may be so nearly equal in point of merit as to render it difficult to say which is the best. In such a case it is the duty of the censors to examine the plants in each collection separately, both as to form and inflorescence, and then if they were equal, the difficulty of cultivation would decide the point, for if one collection contained plants of more difficult management, that of course must have the first prize.

Size, more especially when it arises from age, is not a leading quality, except in plants of very difficult management, and then the mere fact of keeping them alive and in exhibitable condition is very meritorious, for of course plants which are very difficult to grow in a young state must require equal skill to keep them healthy when full grown, but plants which have grown large, and have afterwards been twisted and twined about to make them shapely, should not be exhibited at all, for though we cannot join in the cuckoo song which has been raised about growing plants without stakes, knowing it to be impossible, yet it must never be forgotten that they are a necessary nuisance, and never can be used too sparingly, or too slight in character. In a few words, the leading principles to be observed in plant judging are,—First, that the plants be clean, healthy, and finely formed. Second, that they be profusely covered with bloom, the individual flowers being finely formed, large, and finely coloured. Third, that the plants be choice—novelty and tolerable size being always superior to age and large size. Thus if ten plants were competing, one introduced ten years back and the other only two; and if each required the same skill in management, the new plant, if it had been well cultivated, would be the most meritorious, and should have the first prize. Thus far we have indicated our opinion of some of the rules which ought to be observed by plant censors, and those who judge individual flowers cannot do better than take "Glenny's Properties" as their guide, for though some of his rules may appear arbitrary, they are in the main correct, and the best that have been published .-- A.

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## PROGRESS OF HORTICULTURE, &c.

The Formation of Roads and Walks.—This has been a vexed question for a number of years past, and we are now indebted to Mr. Beaton for having put us in the right, not only as respects sound walks, but also for economical ones, in the first formation and management afterwards, as Mr. B. states, some of the walks at Shrublands have not been weeded since 1843:-"Upon a careful consideration of all kinds of land on which this style of road or walk is to be made, and allowing for the old prejudice of deep-made roads, I have fixed upon six inches as the maximum depth of a carriage-road on the worst kind of bottom, and four inches for a walk over such bottom, and from two to three inches for the best kitchen-garden walks. It is only in a kitchen garden that I would consent to drain under or near the bed of a walk, but every walk in a kitchen-garden ought to have a bed under it as deep as the ground in the borders or quarters is ever likely to be stirred. After the drain is formed and filled in, we have four inches to fill in with the walk, one of which should just be filled with small or sifted coal-ashes, or chalk in powder; this is intended to intercept, to some extent, the damp from below, and to prevent the roots of the trees clinging to the bottom of the walk and getting scorched in hot weather. In all places out of a kitchen-garden I would take as much precaution to keep dampness from the bottom of a good walk as I would do for my bed-room, by drawing away from it—not to it and then the remaining three inches I would make in such a way that no water could pass through to the bottom, but should slip sideways; and for such a walk one inch rise in a ten feet walk will do that; and last of all, the walk is to be one body of solid concrete, made with anything, except gravel, that will concrete, from an oyster shell to granite." "A model road," as Mr. B. terms it, was thus made:-"A thin layer of small chalk was placed at the bottom, not more than an inch or so, then a layer of rough stones, and a heavy roller drawn by two horses passed three or four times over them, which compressed the stones to three inches, the stones being firmly imbedded in the chalk, and the chalk squeezed and oozing through them. After that, a good watering with a water-cart to soften the chalk to the consistency of glazier's putty, then a very thin layer of fine chalk was added, and another layer of stones of a smaller size, or broken with a hammer to the size of a duck's egg, and over that a mixed layer of the roughest of the old gravel and the smallest chalk. This was watered a second time to wash the last layer in among the stones, and next day, when it had drained down and the surface was dry enough, the heavy roller went over the road again several times. The last layer was now carefully prepared by mixing six quantities of the rough gravel with one quantity of the finest chalk, and nearly an inch of this was spread over the whole surface, except at the sides, where lime was used instead of chalk, in order to have a firmer hold to resist the rain-water. The last coat was slightly watered, and when it dried sufficiently to let the roller pass without clinging to it, the final rolling was given, and thus a body of stones were so compressed together that when the road was dry it would have been no easy matter to have undone the road again." "After this description, a garden-walk is a simple process: one stout layer of stones, or, if broken, anything from shells to rough coal-ashes or clinkers will do for a dry bottom; chalk, or chalk-lime, or stone-lime, in the proportion of one of chalk to ten of the other materials, well watered, and rolled to the thickness of three inches, and a rise in the centre of two inches; then cover with half-an-inch of gravel and lime or small chalk mixed, and then finish by one eighth of the best coloured gravel, and roll till all is quite firm. Whatever the width of your walk may be, make up the composition from the bottom four inches wider, and thus you will have two inches on each side, to prevent a raw surface being seen when the edges are cut, and also to prevent worms from working.—(Cottage Gardener, p. 191 and 213.)

The Degeneracy of Fruits.—Mr. Marshall, in the American Horticulturist, (vi, 120), states the prevalent theory on this subject to the effect:—That propagation by grafting or budding is a continuation of the original tree of the variety thus propagated: that is, all the Baldwin Apple trees now growing in the world, are parts of the original tree grown in Massachussetts (U. S.); and their age is to be counted from the time the seed germinated which produced the parent tree, and not from the time when they were grafted. That at some future period (not well ascertained) this variety will produce degenerate fruit; and that its quality can never be brought back to its primitive character, because of the age of the parent tree. Yet a seed of this degenerate fruit will produce a new variety possessing distinct characteristics, which it will retain until it reaches a certain age, when its degeneracy will commence also. Mr. Marshall thinks the evidence on these points inconclusive, and maintains that the degeneracy is rather in the soil and cultivation, than in the tree or its fruit. The virgin soil is cropped and exhausted, and then manured to meet the exhaustion; but the trees do not get the same or a congenial kind of food. As pomologists complain that certain varieties of fruit are not so good now as when they were boys, he suggests that the difference may be between the taste and

judgment of the boy and the man, rather than in a change of the fruit. "A sound healthy graft, from a vigorous tree, in perfect health, worked on a scedling stock of the same genus, grown in similar soil and climate—thus reproduced for ages, will never degenerate."

Vine Borders.-Mr. Buist, of Philadelphia, observes that the risibilities of those who read the various horticultural publications of the day, and reflect on the past, must be frequently agitated by this subject. Nothing, from the days of Adam to Washington, can compare with the blood and carrion of the recent days of Grape growing. What produces the rich and luseious Grapes on the mountain sides of Southern Europe? What on the calcareous steeps around Paris, or the sandy alluvial of Thomery? What gives the exuberant growth and heavy produce of the famous Vine at Hampton Court, or its more famous rival at Cumberland Lodge? A dry bottom; thin warm free soils; with a regular periodical stimulant of decomposed lava, mineral or vegetable substances. Of these two celebrated Vines, the former is said to luxuriate in an old sewer, but this a mere say-so, and not a fact. The latter grows in a dry sandy loam, on a sandy clay bottom that no roots will penetrate - perfectly natural soil peculiar to the locality, and no doubt very congenial to the Vine, which should be analyzed for the benefit of those affected with the carrion and composition mania. Give an artificial Vine border a dry bottom. Go down two feet (not more), less will do, inclining the bottom to some permanent drains. Fill in nine to twelve inches of stones, bricks, &c. Use a compost of four parts surface sod or loam, one part street manure, one part rotted stable dung, well mixed six months beforehand. A few loads of oyster shells or charcoal will be beneficial. Take fair weather to fill in the border, raising it twelve inches above the surface level. Give yearly a light top-dressing of manure, or use liquid manure freely till the fruit colours—not later. Some will say such a border is too poor and too shallow; the Vincs will be weak, and the summer sun will dry them up. What is the alternative? "A border, four feet deep, drained, concreted, bury the whole animal (silver too), and asphalt it to keep down the ammonia," Such is the last and newest idea of this electrical age on Grape Vine borders.—(Horticulturist, vi, 86.)

#### THE HORTICULTURAL SOCIETY.

April 1.—This meeting was very fully attended, and was the richest in plants of any that we have seen for a long time. The most remarkable plant was a new species of Berberry, from Patagonia, contributed by Messrs. Veitch and Son, of Exeter, and it proves, as will be seen by our plate facing page 129, a remarkably fine plant. If it is perfectly hardy, of which there can be little doubt, or even if it should require a wall, it will still be a most invaluable plant. From the same establishment was also a bloom of the Countess of Orkney Camellia. Next in point of importance was a collection of Cut Roses from Messrs. Lane and Son, of Great Berkhamstead, consisting of some of the finest kinds in cultivation, and produced in the profuse abundance of a June exhibition. Messrs. J. A. Henderson and Co. sent a large and finely-grown collection of named Hyacinths, and several other plantsmore especially, the Hebeclinium, or Conoclinium ianthinum, which proves to be a finer plant than we expected. As a novelty, Messrs. Standish and Noble's Azalea vittata, a purple striped variety from China, is deserving of notice as being very showy, but it is too deficient of form and substance to become a general favourite. They also sent Limonia laureola, (Skimmia japonica) sweet-scented shrub from the mountains of India, and a cut specimen of Viburnum macrocephalum. From Mr. E. G. Henderson, of the Wellington Nursery, were two seedling Rhododendrons, and a good plant of Dielytra spectabilis, a Fumaria-like plant of great beauty. A good specimen of the same thing came also from Mr. Edmonds, gardener to the Duke of Devonshire, and one also from Mr. Clark, Nurseryman, of Brixton. Rhododendron javanicum, which proves to be a remarkably fine blooming plant, came from Messrs. Rollisson; and Mrs. Lawrence sent a group of Orchids, consisting of Maxillaria Harrisonii, Phaias Wallichii, an Oncidium resembling sarcodes, and a new and very pretty Epidendrum with a long drooping green flower, which terminated in a broad, rich, orange-coloured, fleshy lip. From the same establishment were good plants of Enkianthus reticulatus, Boronia tetrandra, and Mirbelia floribunda. Messrs. Loddiges sent a handsome rose-coloured Rhododendron, raised from Nepal seed, and Mr. Myatt, of Deptford, two nicely-bloomed plants of Cyclamens. The fruit consisted of tolerable Black Hamburgh Grapes from Mr. Rust, gardener to W. Everett, Esq., and Strawberries from Mr. Higgs, gardener to J. Barchard, Esq., and Mr. Cooper, of Yeovil, Somersetshire, the latter being a seedling kind. Pears from the United States, packed in separate tin cases in a box of salt, were sent as an experiment by Mr. Curtis, of Boston. Seven of the cases were opened, and three of the fruit were found sound and fine in flavour. They were said to be ripened by a process peculiar to Mr. Curtis, the particulars of which did not transpire. From the garden of the Society a number of plants were produced, and Mr. E. G. Henderson sent a nice set of rustic baskets and stands.

April 14.—From their nurseries at Exeter, Messrs. Veitch again produced a cut specimen of the Darwin Berberry, and a great novelty in the form of Cantua dependens, a plant producing, in considerable abundance, large clusters of long Pentstemon-like flowers, of a rich purple colour. Messrs. Henderson sent a Grevillea resembling rosmarinifolia, but much smaller, and flowering very profusely, a new Pultanæa, and Oncidium hastatum. Mr. E. G. Henderson had a collection of Gloxinias, among which G. spectabile and Boyelderii were the most remarkable, and the best; and a plant of Besleria umbrosa, which proves to be worthless. Messrs. Jackson, of Kingston, sent some cut specimens of Rhododendrons, from Kamoon, kinds pretty enough in their way, but not possessing much novelty. Mr. Higgs again sent some good Strawberries; and some tolerable Black Hamburgh Grapes came from Mr. Martin, gardener to Sir H. Fleetwood, Bart. Mr. Jones, gardener to Sir John Guest, sent two nicely grown Enville Pines, one weighing 4lbs. 4oz., and the other 3lbs. 14oz. The usual contributions of plants were sent from the garden of the Society, among which Salvia gesnerifolia, a brilliant scarlet species, which flowers at this season, and a very neat heath-like bush, of singular origin, called Bryanthus erectus were the most remarkable.

#### THE NATIONAL FLORICULTURAL SOCIETY.

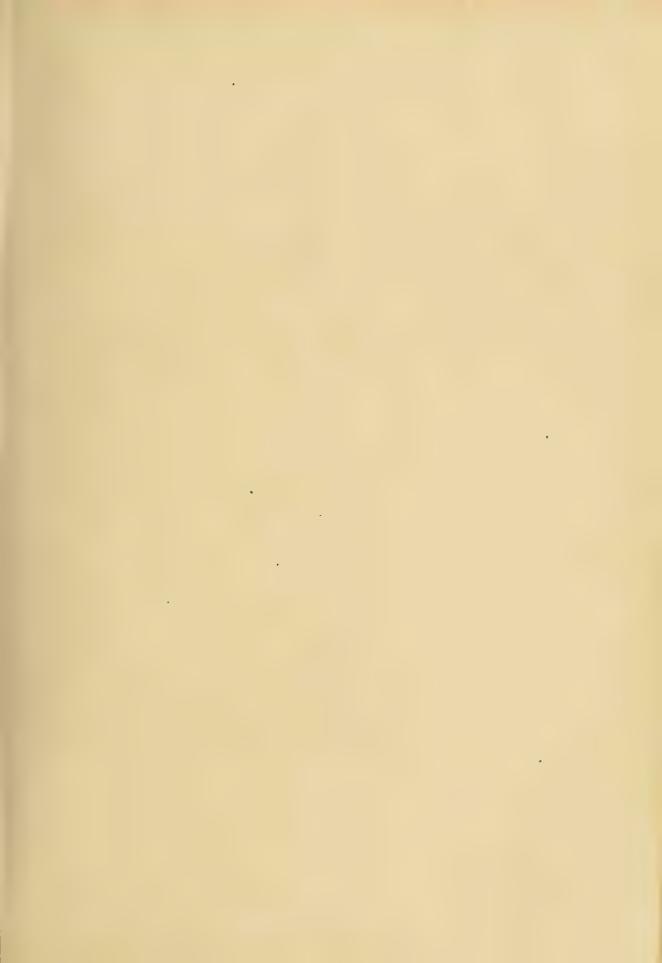
April 3.—The first exhibition of this new society took place at the Office of the Society, 21 Regent Street, and if the contributors maintain the same spirit as they have commenced with, florists' flowers will at last stand a chance of being properly represented. A number of plants were produced, among which, of course, at this season, Cinerarias were the most numerous, and some very tolerable kinds were produced, though the great majority would certainly have been better away. The principal contributors were Messrs. Henderson, of Pine Apple Place, Mr. E. G. Henderson, E. Beck. Esq., Mr. Ayres, of Blackheath, Mr. Keynes, Messrs. Lane, Mr. Robinson, Mr. Ivery, and Mr. Gaines. Mr. Turner, of Slough, sent a nice box of Pansies, and a small collection of Auriculas; and Mr. Bragg, of Slough, had also some Pansies. Certificates were awarded to Mr. George Smith, of the Tollington Nursery, Hornsey Road, for a Cineraria, called Queen of Beauties-pure white, with blue disc; and Mr. Ayres had a similar reward for a Cineraria, named Orpheus, a lilac purple flower of fine form, and admirable habit. For Rhododendron superbissimum album, Mr. E. G. Henderson received a certificate. From the same gentleman came two good Cinerarias, named Loveliness and Christabel; and Mr. Rogers, of Uttoxeter, forwarded Lady of the Lake, a flower of considerable promise. Mr. Turner had a promising Pansy, named "National," which the censors desired to see again. A Camellia Exquisite, which had fallen to pieces, came from Mr. Story; and a Primula and Polyanthus, in a cut state, were contributed by Messrs. Chater. From Messrs. Standish and Noble we noticed the Azalea described in a previous page; and Messrs. Veitch sent Fuchsia spectabilis and Rhododendron jasminiflorum. Most of the gentlemen above named sent plants for decoration.

April 24th.—This meeting, like the preceding, was very numerously attended, and a number of seedlings of various kinds were produced, some of very considerable merit. Collections of Cinerarias of the named and older kinds, were contributed by Mr. E. G. Henderson, among which we noticed Pauline, Brilliant, C. Kean, Formosa, Effie Deans, Georgiana, Amy Robsart, Enchantress, and Lady Hume Campbell. Messrs. J. A. Henderson, of Pine Apple Place, sent Cinerarias—Pauline, Lettice Arnold, Madame Sontag, Lady Gertrude, and several others. From Mr. Ivery, of Peckham, came Ormsby Beauty which resembles Edmondsiana too closely, Electra, and Blue Perfection. Collections of Pansies were sent by John Edwards, Esq., Mr. Turner of Slough, and Mr. Bragg; and several variegated foliaged Pelargoniums were sent by Mr. E. G. Henderson. Mr. Ayres had two fine specimens of Pelargonium-Quercifolium Coccineum superbum, and Lady Rivers; and Mr. Turner of Slough sent six Auriculas. Of seedling Pelargoniums, G. W. Hoyle, Esq., received a certificate for Chieftain, a plant of fine habit, upper petals dark crimson blotch, margined with scarlet, lower petals vermilion. The same gentleman sent Celia, a promising flower. Mr Turner sent a promising flower called First of May, which was commended by the censors of Fancy Pelargoniums. Mr. Ayres had a first class certificate for Formosissimum, a flower of exquisite form and habit. Mr. Ayres also sent Gipsey Queen, a promising flower, and remarkably showy.

Among Cinerarias, a certificate was awarded to Mr. G. Smith for Alba magna, a white flower with dark disk. To Mr. E. G. Henderson a reward of the same amount for Marion, and a certificate of the first class for Marguerite d'Anjou. Tickets of Commendation were awarded to Mr. Ayres for Model of Perfection, and to Mr. Ivery of Peckham for Beauty; the same gentleman also produced Beauty of Hammersmith, which proves to be a very showy kind. A seedling Auricula was sent by Mr. Griffin

of Bath, a grey-edged variety, to which a first class certificate was awarded.

Jac 1





#### PULTENÆA ERICOIDES.

Nat. Order.—LEGUMINOS.E \ PAPILIONACE.E.

Generic Character.—Pullenæa, Smith.—Calyx bell-shaped, half-five-toothed, almost equal or with the two upper lobes broader and cohering farther up, somewhat two-lipped. Corolla papilionaecous; standard rounded, entire, or notched, longer than the oblong wings; keel oblong or obovate, straight, very often obtuse, about equalling the wings, or sometimes a little longer. Stamens ten, free; filaments glabrous, naked. Ovary sessile, with two ovules, villous; style awl-shaped, glabrous, deciduous, more rarely villous at the base and a little dilated; stigma slender. Pod ovate, compressed, or somewhat inflated, acute or obtuse. Seeds strophiolate.—New Holland shrubs; the leaves alternate, simple, quite entire or two-lobed at the summit; stipules scarious, often intrafoliaecous, sometimes imbricated, more rarely wanting; inflorescence terminal or axillary, flowers solitary or capitate, bracts scarious, often

bifid at the point, formed by the two stipules of an abortive leaf, sometimes wanting, bracteoles scarious or more rarely somewhat leaflike, adherent to the calyx, and usually shorter than it, very rarely almost imperceptible; flowers yellow, the keel very often becoming purple or more deeply coloured; the strophiole of the seeds incised at the back in most, sometimes two-lobed or else entire.—(Endlicher Gen. Plant., 6446.)

Pultenea.—Shoots tomentose, leaves scattered, linear involute, minutely tubercled on the lower face, hairy, mucronate; stipules subulate, brown, and membranous; inflorescence crowded into heads, at first terminal but afterwards producing innovations, with the flowers in the axil of perfect leaves; bracts two, resembling the stipules not longer than the calyx.

ESCRIPTION.—A small leafy shrub with elongated ascending branches, which, when young, are covered with a minute dusky tomentum. The leaves are half an inch long, numerous, scattered, with a pair of small elongated subulate brown membranous stipules; the blade of the leaf linear and rendered semi-terete by the involution of the two margins, so as to present merely a channel along the upper face, the surface minutely tubercled and with scattered longish spreading hairs, the points of the leaves mucronate. Inflorescence crowded into heads, at first apparently terminal but producing innovations after flowering: the flowers arising in the axils of green leaves, which are like the stem-leaves, but have rather broader membranous stipules adherent some way up to the margins of the leaves. Bracts two, resembling the stipules already mentioned and just above them. Flowers solitary, sessile. Calyx with a bell-shaped tube and a five-toothed distinctly two-lipped limb, the teeth elongate subulate, with hairy cilia. Corolla with an orbicular long-clawed somewhat reflexed standard, deep yellow, veined from a dark disk with brownish purple, and having a yellow eye in the centre of the base; wings shorter, oblong, somewhat rosy purple; keel about equal, of the same colour. Filaments glabrous, reddish at the upper part. Ovary sessile, downy, two-seeded; style compressed laterally, hooked at the summit; the stigma somewhat capitate.—A. H.

History, &c.—Our plant was raised by Messrs. Henderson of the Pine Apple Nursery, Edgeware Road, from seeds sent by Mr. Drummond from the Swan River colony. It produced blossoms in April 1850, when our drawing was made; and again, equally profusely, in the past spring. The sturdy and free-blooming habit of the plant, together with its broad masses of gaily-tinted flowers, will render it a valuable acquisition to the greenhouse and exhibition tent. The branches have considerable resemblance to those of some of the coarse-leaved Heaths; and, in the plants we have seen, were of the spreading habit shown in our figure.

Culture.—This distinct and pretty plant, which comes, like many of its congeners, from the Swan River, promises to be very suitable for forming those dwarf compact bushes so much admired at our metropolitan exhibitions; and, though the plant may never become very large, it will, from its profuse habit of blooming, be a very interesting one. It is propagated by cuttings of the half matured wood, in sand, under a bell-glass; but, like most hard-wooded plants, the cuttings pots should not be put in heat until just at that period when the roots begin to protrude. In cultivation, it requires sandy turfy peat and sand when in a young state; but as it increases in size and gains strength, about one-third of nice mellow loam may be added with advantage. Pot firmly, giving abundance of drainage, and water liberally when the plants are in a free growing state. The temperature of the ordinary greenhouse is sufficient for this plant; but, to get it to a tolerable size in a short time, it must be drawn out by a little extra and moist heat,—say a temperature of from 50° to 65° from May until the growth is completed. Weak clear liquid manure may also be given when the plants are in free growth and the pots tolerably full of roots.—A.

VOL. III.

### THE METROPOLITAN MAY EXHIBITIONS.

No this, the greatest of all exhibition years, it was natural to suppose that those who have done so much to sustain the reputation of the country as an exhibition one, would do all that they could to sustain their well, but hard-earned, reputation. Partly, however, to the cold, cloudy, and unfavourable state of the weather, and partly to the very early period at which the exhibitions were held, the plants were not so fully bloomed, neither were they so highly coloured as they would have been under a more sunny sky, and consequently favourable circumstances. This remark applies more especially to the Heaths and New Holland plants, many of which, to colour them perfectly, require full air, and bright sun-light.

The absence of bad gardening was very remarkable, as scarcely a bad plant could be seen; but still, as the truth must be spoken, we must assert, that evidence of decided and manifest improvement was also wanting. The Azaleas were, as they always are in May, a glorious sight, and one would almost imagine cultivation could go no further, for certainly some of Mrs. Lawrence's plants were most extraordinary specimens, and in such rude health that persons with only ordinary accommodation would begin to think seriously of the great space required for their accommodation, and we should wish they had the "Crystal Palace" to admit of their full development, for knowing these plants from the time they left the nursery, we consider them, notwithstanding their Brogdignagian proportions, as still in their infancy, and consequently hope that they may have sufficient room to admit of their arriving, unrestricted, at a mature old age. Mr. Green's plants, though admirably bloomed, were in point of cultivation very inferior to Mrs. Lawrence's plants; they were too smooth, too artificial, and wanted the rude health and easy grace of the first-named specimens. At the Regent's Park the Messrs. Fraser also showed some good plants, as did also Mr. Roser, and Mr. Cole.

Next in point of improvement must be enumerated the Roses, which are certainly improving vastly in cultivation, and becoming, and deservedly, universal favourites. At Chiswick, Mr. Francis had the best bloomed plants; but the specimens produced by Messrs. Paul and Lane were larger, though not sufficiently in bloom. The reputation of the amateur growers was well sustained by Mr. Terry, Mr. Roser, and A. Rowland, Esq.; and perhaps the gem of the Rose Exhibition was a specimen Baronne Prevost, from Mr. Terry, which had flowers much larger than the best we ever saw in the open garden. The leading, and most remarkable kinds, were Coupe d'Hebe, Paul Perras, Chenedole, Armosa, Madame de St. Joseph, Lamarque, Viscomtesse de Cases, William Jesse, Niphetos, Comte de Paris, Aubernon, Duchess of Sutherland, Géant des Batailles, Fulgorie, Mrs. Bosanquet, Marquise Bocella, Augustine Mouchelet, Goubalt, and Baronne Prevost. At the Regent's Park, Mr. Francis had a small box, containing worked plants of Géant des Batailles, small plants under one foot in height, with a magnificent flower upon each. For many purposes of drawing-room embellishment, these small plants, being grown in small pots, were perfect.

The bank of Orchids, as seen at Chiswick, was a magnificent sight; but at the Park the stage is too low for them, and consequently they were not so effective. It is impossible to conceive anything so splendid as these collections, viewed en masse, with their many coloured, singular, fragrant, curious, and, in many cases, gorgeous flowers intermixed; but examined separately, we incline to the belief that though they are bloomed better, the specimens are not so large as those exhibited several years back. It is true there were many noble specimens of cultural skill; but they formed the exception, and not the rule, as compared with collections of other plants. We therefore consider it necessary that some special inducement should be held out to encourage specimen growing, and we doubt not the object would soon be attained. Among the most remarkable plants may be enumerated, Cattleya Skinneri, Vanda suavis, Dendrobium Devonianum in lovely condition, Saccolabium guttatum, Lycaste cruenta, Aerides suavissimum, Epidendrum inversum, Dendrobium chrysanthum, Burlingtonia fragrans, Chysis bractescens, Phalænopsis amabilis, Ansellia africana, Dendrobium Wallichianum, and Farmerii, Epidendrum bicornutum. Messrs. Veitch, of Exeter, had some noble plants; among them, Cypripedium caudatum in fine condition, and better coloured than we have previously seen it; Dendrobium Devonianum, and Pierardi hanging gracefully from baskets, and a fine D. nobile. Messrs. Rollisson sent Acineta Humboldti and Barkeri, Lycaste Deppei and cruenta, Dendrobium Paxtoni, and several other plants.

Among miscellaneous plants and collections a great quantity of things were produced, and, as a matter of course, the gardeners of Mrs. Lawrence and Mr. Colyer were the principal competitors. Both had fine collections, but at Chiswick Mr. Coles' plants were the best, though not so placed by the censors. It would be impossible to conceive anything finer than his Hoya imperialis, Aphelexis spectabilis grandiflora, Ixora crocata, a mass of blooms, Clerodendron splendens finely bloomed,

lexis med, Leschenaultia formosa, Franciscea acuminata, and Azaleas; they were fresh, full, and profusely bloomed, and altogether in admirable condition. Mr. May had, as usual, Epacris grandiflora, a huge bush, now becoming, from its notoriety, very stale, and which, from being so intertwined in training, a friend suggested would make an excellent living aviary; Pimelea spectabilis not sufficiently in bloom, Chorozema varium and Lawrenceanum, Boronia serrulata and pinnata, Gompholobium polymorphum a nice bush; Ixora javanica in fine condition, with some nice plants of Azalea, Pultenæa stipularis, Leschenaultia, &c. Large collections came also from Messrs. Fraser and Mr. Pamplin.

In the smaller collections, we noticed in Mr. Green's lot a most admirable Ixora coccinea, splendidly coloured—and which, after all, is the finest of the genus; fine Epacrises and Leschenaultias, Æschynanthus Lobbianus, Boronia pinnata, and Chorozema varium. Mr. Taylor had a fine Adenandra, Hoya carnosa, Dracophyllum gracile, Pimelea spectabilis, and several Everlastings and Heaths. Collections of ten stove and greenhouse plants were produced in great quantity, and several new competitors made their appearance. Among the most remarkable plants, we noticed Franciscea macrophylla, a splendidly bloomed plant; Adenandra speciosa; and Oxylobium Pulteneæ. Mr. Speed had a very compact group, in which was a plant of Clerodendron fallax in admirable condition, being dwarf, clean, and healthy, and splendidly bloomed; Eutaxia pungens, Leschenaultia formosa, Pimelea Hendersonii, and Tetratheca verticillata were also in fine condition. Mr. Croxford produced some very neat plants, especially Epacris grandiflora, Pimelea spectabilis and Hendersonii, and Leschenaultia Baxteri. Several small collections of plants were sent respectively by Messrs. Williams, Over, Dods, Watson, and Kinghorn. The Heaths were scarcely sufficiently in bloom, and, as previously remarked, they wanted colour. The plants, however, produced by Mr. Quilter's gardener were admirably cultivated, and remarkably neat; as were also those from Mr. Cole, Messrs. Rollisson, Epps, and Fairbairn, who sent fine collections. The best kinds were :--Suaveolens, tortiliflora, ampullacea carminata and vittata, favoides elegans and purpurea (a fine kind), mutabilis, dilecta, mundula, vasiflora (one of the most elegant of Heaths), elegans, Sprengelii, Hartnelli, triumphans, Sindryana (a very pretty early kind), florida, primuloides, campanulata, Cavendishiana, depressa, aristata, propendens, and Thun-

Single specimens were less numerous than usual, still some splendid plants were produced. Messrs.

Veitch sent Medinilla magnifica, a most remarkable plant; Mr. Iveson, Indigofera decora, an elegant and useful plant; Mr. Cole, Hovea Celsi; T. B. Graham, Esq., Erica Sindryana, a splendid plant; Mr. May, Boronia serrulata; Messrs. Fairbairn, Erica favoides: and Messrs. Veitch, Rhododendron jasminislorum. At the Regent's Park, the most remarkable specimens were Leschenaultia formosa, from Miss Trail, and Pimelea spectabilis, from Mr. May.

Of new plants, Messrs. Veitch sent Cantua dependens, thus described by Dr. Lindley:—"The most glorious species that has yet reached us from the



RHODODENDROS JASMINIFIORUM,

west; a shrub as hardy as a Fuchsia, and far more gay, because of the rich mixture of yellow and purple and violet in its long tubular flowers." Mr. Baumann, of Ghent, had Deutzia graeilis, a dwarf

white-flowered slender-growing shrub, from Japan, which is supposed to be quite hardy; and, at the Regent's Park, Messrs. Veitch had a good specimen of the same thing. Mr. Cole had a nice plant of Allamanda neriifolia, a most abundant blooming kind, and Mr. Loddiges, a very fine Aerides. Ixora Griffithii came from Mr. Green, and, though finely grown, is still too dull in colour to become a general favourite. Mr. Carson had Trichopilia coccinea, with a large dull red lip, and Mr. De Jonghe, of Brussels, a Billbergia. At the Park, Mrs. Lawrence sent a raceme of Amherstia nobilis, with Epidendrum Lawrencianum; Messrs. Rollisson, Bolbophyllum Henshalli; Mr. May communicated Hoya bella; Messrs Veitch, Collinsia tinctoria; and Messrs. Henderson, Franciscea confertifiora, Pultenæa juniperina, two Ceanothuses, and Bossiæa Hendersonii. Mr. Mitchell, of Brighton, sent Brunsfelsia nitida, from Jamaica.

Of Pelargoniums there were none; but Mr. Ayres and Mr. Ambrose had fine stands of the Fancy kinds. At the Regent's Park there were numerous collections of both kinds, but they were not fine. The dull, heavy, hazy winter and spring, an inactive atmosphere, with low temperature, were not sufficient to keep the fluids of the plants in active motion, and hence the prevailing disease, which is induced principally by high feeding, could be seen in every collection. Some of the plants were denuded of foliage, and upon others it had anything but a healthy appearance. Viewed as a whole, the collections at the Park had a fine effect; but, examined separately, there was nothing very remarkable in point of cultivation. We also noticed, among the so-called new and first-rate, a number of old kinds, which certainly had no business in such a class—such as Norah, Forget-me-not, Gulielma, Negress, Pearl, Ondine, &c. These should certainly not be regarded as new flowers. The same remark applies to the Fancy class: such things as Madam Miellez, Anais, Lady Rivers, and Jehu superbum, though pretty enough at home, are not fit for exhibition. Of Seedling Pelargoniums, Mr. Hoyle received a Certificate for Magnet, a crimson scarlet, with dark blotch, large truss, and fine habit. Mr. H. had also Celia, Chieftain, and one or two others. Mr. Ayres also received a Certificate for his Fancy Pelargonium, Formosissimum, the best shaped of its class. Cinerarias were shown in great abundance, but none of them very remarkable; and the same may be said of Calceolarias. Pansies in pots, at Chiswick, came from Mr. Turner of Slough and Mr. Bragg: they were admirably grown, and bore some fine flowers; but still, to be effective, they must have more flowers, and those in different stages of growth. At present they are too artificial; and though the flowers may please the florist, they are too formal for the general observer. However, it was a good beginning. The fact that they can be grown in that way was proved; and no doubt they will ultimately prove a very interesting display. We must not omit to notice Mr. Kinghorn's Epacris conspicua, which is a fine variety, between grandiflora and miniata; and Mr. Hoyle's Epiphyllum speciosum, called Brockii, which is a very splendid variety. Fruit does not call for any special remark. It was tolerable for the season, which has been a bad one, but still not very remarkable.—X.

## VISITS TO REMARKABLE GARDENS.

The Suburban Residence of N. B. WARD, Esq., at Clapham.

OST of our readers, no doubt, have heard of the Wardian Case—that ingenious contrivance for the ALL growth of tender plants in the polluted air of populous smoky localities, and admirable receptacle for plants en voyage, which had its origin in the accidental growth of a fern and a grass in a close glass vessel containing some moistened earth, which had been left for some time untouched. For many years past, by the aid of these closed cases on a somewhat enlarged scale, a considerable variety of plants has been cultivated with complete success, even in the most unfavourable spots in London. Mr. Ward's courtesy enables us, in the accompanying wood-cut illustration, to give a representation of the interior of a structure, on precisely the same principle, but on a larger scale, which he has more recently erected at his residence at Clapham; and which certainly forms one of the most interesting garden sights in the neighbourhood of the metropolis, not so much for its size or architectural proportions as on account of the great variety of interesting plants which, by the plan adopted, have been accommodated in a very limited space; and more especially on account of the principle which is here exemplified, and which has a material bearing on the practice of horticulture.

We confine our notice at present to the enlarged Wardian Case just alluded to; and we are happy to be able to introduce here the following remarks in reference thereto, with which Mr. Ward has kindly furnished us:—

"The philosophy of the growth of plants in closed cases has been so repeatedly before the public, that it is not necessary to dwell at length upon the subject. The object I had in view in the con-

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struction and planting of my large closed case, was to give a representation (in miniature of course) of a tropical forest, in which the plants were to be seen growing in something like a state of nature.



MR. WARD'S FERN-HOUSE.

The ground was prepared for their reception by covering the gravelly soil of the garden with a foot or two of old brick rubbish, and upon this about two feet of sandy peat mould. In this soil most of the Palms, Ferns, Bamboos, Bananas, &c. are planted. Some plants grow better in yellow loam, some in sand or clay, &c.; but all have their wants supplied. A very great variety of different plants can be grown in a house of this kind by a little management. Shade-loving plants thrive in the darker parts, whilst succulent plants of all kinds grow equally well suspended from the roof. All have the benefit of an atmosphere free from mechanical impurities, which might interfere with the action of the leaves; and at the same time this air is always undisturbed, enabling the plants to bear without injury very varying degrees of temperature. The thermometer in the winter months often falls to 40° during the night, rising to 100° in the day, even in the month of December, if the sun shine brightly. In summer the variations are still greater, the thermometer occasionally falling as low in the night, (in consequence of there being no fire,) whilst at mid-day it is frequently as high as 130'. This high temperature, however, does not often occur, as the house is shaded by a blind. Circulation of the atmosphere is effectually secured by means of that beneficent law which compels the diffusion of the various gases which, either in a course of nature or as the result of various chemical operations, are continually being generated on the surface of the earth. By virtue of this law, the moment any gas is formed in the house, differing from the atmosphere without, diffusion immediately takes place; and that uniformity of its component parts, which philosophers have ascertained to be the case in air examined from every portion of the earth's surface, is the result. Open exposure to air is very seldom required with the majority of plants, whether natives of cold or of hot regions, if their wants are duly supplied. Oxalis Acetosella, Dentaria bulbifera, Primula vulgaris,

Convallaria multiflora, Clerodendron fragrans, Canna indica, Strelitzia Reginæ, Begonias, and hosts of other plants, have flowered with me in closed cases for many successive years! and many fruits, particularly those of tropical regions, ripen well. The fact is, that in these cases we are enabled to include all the agents which can contribute to the well-being of the plants, and exclude those which produce deleterious effects.

"I cannot conclude without suggesting the adoption of this plan in the general cultivation of plants. Where a large number of species is required to be grown, a series of houses might contain representations of various regions of the earth, fitted up to meet the wants of the characteristic flora of each region, and forming most beautiful tableaux vivants of the aspects of the vegetable kingdom. Thus, from our miniature tropical forest we might pass to the sandy flats of the Cape of Good Hope, with its bulbs, Mesembryanthemums and Heaths; and thence to New Holland, with its Epacrids and beautiful Leguminosæ, &c.; and, if sufficient elevation could be obtained, Teneriffe might have a place in this grand exhibition, displaying its Dragon Trees, Laurel forests, columnar Euphorbiaceæ, Cacti, &c. &c. Each particular country might thus be represented. The Crystal Palace might well be appropriated to such a design, which would, I think, be quite as interesting as the purpose for which it was erected."

We have not space here to enter into the general question of ventilating plant-houses; but no one can fail to remark, that the example which we here produce militates strongly against the now general persuasion, that what we may call "free ventilation" is essentially necessary to the well-being of plants grown in glass-houses. Some few years since we urged the same views which Mr. Ward's experience now confirms; and though the outcry for fresh air has since that time been louder than before, it still appears to us that the admission of the external atmosphere is of more importance as a regulator of temperature than as a purifier of the confined atmosphere of the interior. Ventilation or aëration also seems of more importance by night than by day. (See Journ. Hort. Soc., i. 110; ii. 28.)

Abundant ventilation, it is urged, is necessary to secure the sturdy health of plants, to give brilliancy to vegetable colours, and to impart high flavour to fruits. Well, it appears that all these objects may be perfectly secured without ventilation at all, in the sense intended. As to healthy vegetation and brilliant colours we can ourselves speak positively, from repeated observations in the structure represented in our wood-engraving, where no ventilation in the ordinary sense is attempted; and we have Mr. Ward's authority to state that a correspondent of his has succeeded perfectly with a crop of grapes on the same close system. These facts we leave for the cogitation of our abundant-ventilating friends.

Our engraving, however, points specially to one other feature in gardening matters. It suggests practically the picturesque arrangement of plants grown for ornament. This mode of arrangement offers so many advantages over the more ordinary and formal mode, that it is matter of surprise it is not more commonly adopted. Not only is an infinitely more pleasing effect produced, but a much greater variety can be accommodated within a given space, with a much less demand of cultural attendance. For those amateurs who manage their own gardens, such an arrangement is highly to be recommended. Once planted, in which operation judicious aid may if necessary be employed, the plants might be left, if need be, for a week or fortnight in summer absolutely without attendance, except that of shading, which any domestic could be made to understand; and not only would no damage ensue, but the plants would all the time be progressing just as surely as though their progress had been daily watched. In winter, the supply of artificial heat would have to be attended to; but even this, with the aid of a simple hot-water apparatus, would be by no means beyond a domestic servant's comprehension, in the temporary absence of the proprietor.

We have left ourselves but little space to notice the many interesting plants crowded into Mr. Ward's small house. Passion-flowers, Manettias, Aristolochias, and such like, cover the pillars and festoon the roof, from which also Orchids are suspended. The raised rocky mounds on either side give pasturage to various small Palms, Ferns, Bamboos, Musas, Cannas, Colocasias, Clerodendrons, Achimenes, and hosts of smaller plants. The Cuphea ignea here grew, and flowered from year's end to year's end, until it became too large for the space. Fuchsias, too, which grew luxuriantly and flowered profusely, became too large, and had to be rooted out. A tank at the end affords accommodation for gold fish, and some of the smaller aquatic plants. The whole forms a beautiful miniature tropical forest scene.—M.

#### THE ASH OF ARMERIA MARITIMA.

R. VOELCKER has made some experiments on the composition of the ash of Armeria maritima from R. VOELCKER has made some experiments on the composition of the sea-shore near Edinburgh; different localities. The plants analyzed were procured—(1), from the sea-shore near Edinburgh; (2), an elevated trap rock near Edinburgh; (3), light sandy soil in Mr. Lawson's Nursery; (4), granitic rocks on the mountains of Braemar. Traces of iodine were detected in the ash of the specimens grown in the first locality, but none in any of the others. In certain cases soda was replaced by potash. The plants from the three first-mentioned localities gave the following results:—1. The proportion of alkaline chlorides, as well as that of silica, was considerable. 2. The quantity of soda was more abundant in the ash of specimens grown near the sea-shore, whilst potash prevailed in the ash of plants grown on the solid rock near the shore. 3. Soda was entirely replaced by potash in the ash of the plant grown in the nursery. 4. The quantity of phosphoric acid in No. 3 was considerable, when compared with that in Nos. 1 and 2. 5. The proportion of magnesia in the ashes of Armeria in its natural state, was larger than in the ash of specimens grown in the nursery. Dr. Voelcker suggests that the chloride of sodium found in the specimens from Braemar may arise from the spray of the sea, or particles of salt carried inland by the winds and other agencies. Iodine has been detected by M. Chatin in many aquatic plants in France, such as Water-Cress, Marsh-Marigold, Water-Lilies, Reeds, various species of Carex, Villarsia, Menyanthes, Myriophyllum, Ceratophyllum, Potamogeton, aquatic Ranunculi, Charas, Confervæ, Callitriche, Fontinalis, Stratiotes, Scrophularia, &c.; but not in Ranunculus acris, bulbosus, repens, nor Cardamine pratensis, although it was present in all the aquatic species of Ranunculus and Cruciferæ examined. M. Chatin's conclusions are, that—(1). Plants which grow in running waters, and in sheets of water sufficiently large to be strongly agitated by winds, contain more iodine than those growing in stagnant waters. (2). Iodine is generally found, although in small quantity, in plants which are only partially covered with water, or only during a part of their life. (3). Plants which contain iodine, when growing in water, lose it when they are developed out of water. (4). The proportion of iodine observed in plants is independent of their place in the natural system, and in general has no relation to specific character. Indine would thus appear to be an accidental inorganic ingredient. It is present only in cases where iodine or salts of iodine are contained in soil or water in which the plants grow.

# New and Rare Plants.

Thyrsacanthus lilacinus, Lindley. Lilac-flowered Thyrsacanth (Journ. Hort. Soc., vi. 159).—Nat. Ord., Acanthaceæ § Echmatacantheæ-Gendarussæ.—A soft-wooded stove shrub, with thin downy wrinkled oblong lanceolate leaves, and contracted thyrsoid panicles of pale lilac flowers, which are funnel-shaped and inflated, with a four-lobed limb; the upper lip erect and two-lobed, the lower deeply divided into three revolute segments. Origin unknown. Flowers in spring. Horticultural Society of London.

Lonicera tatarica, Punicea. Crimson Tatarian Honeysuckle (Journ. Hort. Soc., vi. 52).—Nat. Ord., Caprifoliacea § Lonicerca.—A hardy shrub, growing about five feet high, having ovate-lanceolate leaves, and small deep rose-coloured flowers growing from their axils. These are however larger, as well as later than in the parent, and hence, as it is not so liable to be cut by spring frosts, this variety will form a handsome addition to early flowering shrubs. From Siberia. Introduced about 1848. Flowers in April. Horticultural Society of London.

Rogiera versicolor. Changeable-flowered Rogiera. (Bot. Mag., t. 4579).—Nat. Ord., Cinchonacea § Cinchoneæ.—Syn. Rondeletia versicolor, Hooker.—A handsome evergreen stove shrub, of moderate size, with the branches and young leaves clothed with silky hairs. It has large, deep green, ovate-acuminate leaves, obtuse or subcordate at the base; and large downy trichotomously divided cymes of small, but pretty flowers, which are remarkable for the play of colours; the tube being yellow, the limb in bud deep rose-colour, paler when expanded, then changing to white, having a yellow disc, the two-lobed green stigmas just protruding. The plant has "very bitter bark." It is nearly allied to R. cordata. From Central America. Introduced in 1838, by Mr. Seemann. Flowers in early spring. Royal Botanic Garden, Kew.

Siphocampylus hamatus, Wendland. Hooked-ealyxed Siphocampylus. (Part. Fl. Gard. ii., 28). -Nat. Ord., Lobeliacee § Lobelew.--A stove shrub growing six feet high, covered with white down. The leaves are oblong-ovate, or somewhat heartshaped, with callous teeth. The flowers are violet-coloured, having the lobes of the calyx hooked backwards, and the tube of the corolla narrow and slender. From Brazil. Introduced to the German Gardens.

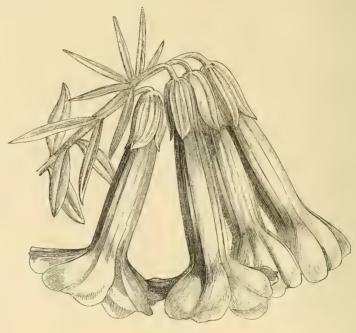
Chysis aurea, Maculata. Spotted Golden-flowered Chysis. (Bot. Mag., t., 4576). - Nat. Ord., Orchidaece § Epidendrew-Lacliadew.—A very showy stove epiphyte, closely related to C. aurea, and differing in the colour of the flowers. The sepals and petals in this variety are yellow in the lower half, the upper half being occupied by

a large orange-brown blotch; the central and principal lobe of the lip is white, marked with large distinct purple blotches; the rest of the lip is yellow. The flowers are very showy and very fragrant. From Columbia. Introduced in 1850. Flowers in winter. Messrs. Lucombe, Pince and Co., of Exeter.

CANTUA BUXIFOLIA, Lamarck. Box-leaved Cantua (Bot. Mag., t. 4582).—Nat. Ord., Polemoniaceæ.—Syn., C. ovata and C. tomentosa, Cavanilles; C. uniflora, Persoon; Periphragmos dependens and P. uniflorus, Ruiz and Pavon.—A most beautiful greenhouse bush, very much branched, the branches downy. The leaves are variable

in form, generally oblongovate, and either entire or sinuate-serrate, and downy or glabrous. The very large drooping flowers form a leafy terminal corymb; the thick tube of the corolla is three inches long, the limb spreading an inch and a half across, deep rose, almost crimson, the tube reddish yellow. It appears to be an easily-grown greenhouse plant, requiring something the treatment of Fuchsias. From the Peruvian Andes. Introduced in 1849. Flowers in April and May. Messrs. Veitch and Son, of Exeter.

Dombeya Mollis, Hooker.
Soft-leaved Dombeya (Bot.
Mag., t. 4578).—Nat. Ord.,
Byttneriaceæ § Dombeyeæ
—Syn., Astrapæa mollis of
gardens.—A coarse tropical
tree, with large soft cordate
three-lobed leaves, and dense
capitate umbels of small narrow-petalled rose-coloured



CANTUA BUXIFOLIA.

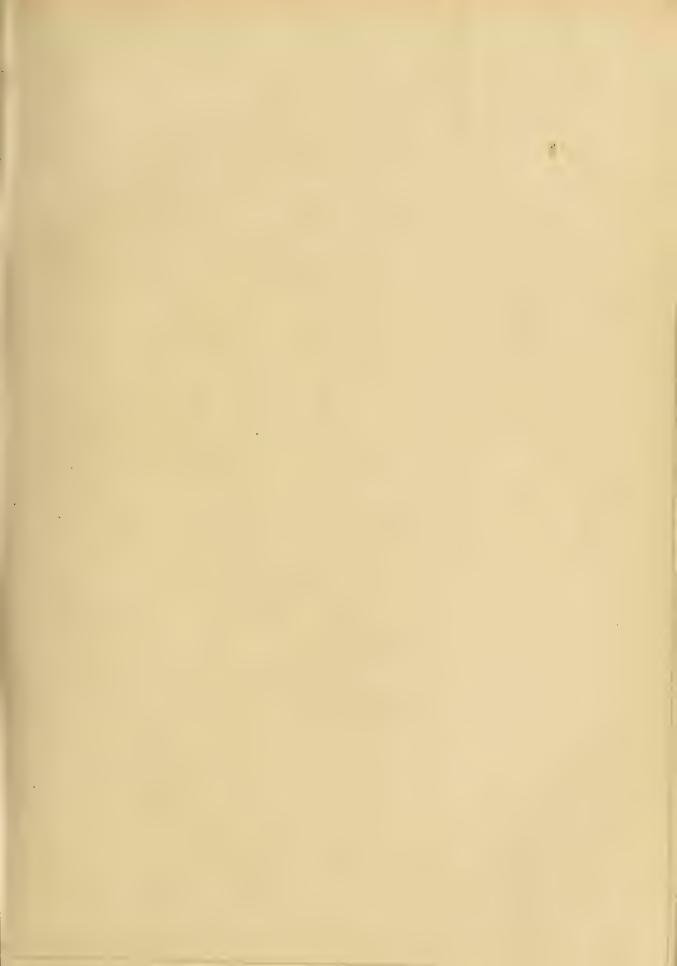
flowers, smelling like Hawthorn. Native country not stated. An old inhabitant of the Royal Botanic Garden of Kew. Flowers in March.

Tropæolaceæ § Tropæoleæ.—A climbing, half-hardy plant, supposed to be an annual, having peltate, smooth, slightly five-lobed leaves, and solitary axillary pendulous flowers, with a yellow five-lobed calyx, and yellow spathulate petals, crenated on the upper edge, the upper ones marked with parallel red lines, and a dull violet bar near the edge. From Central America. Introduced to the German gardens in 1849. Flowers in summer.

QUERCUS AGRIFOLIA, Nee. Prickly evergreen Oak (Journ. Hort. Soc., vi. 157).—Nat. Ord., Corylaceæ.—An evergreen Oak, which in its native country grows forty or fifty feet high, having hard brittle reddish wood, evergreen leathery leaves, varying from roundish-ovate to elliptic, and nearly as prickly as a Holly. The female flowers, seated close in the axils of the leaves, are succeeded by long ovate, almost conical-pointed acorns, growing in hemispherical scaly cups. From California. Introduced by Hartweg in 1848. Horticultural Society of London.

Acacia urophylla, Bentham. Pointed-leaved Acacia (Bot. Mag., t. 4573).—Nat. Ord., Fabaceæ § Mimoseæ. —Syn., A. smilacifolia, Fielding.—A distinct-looking greenhouse shrub, but less beautiful than many species of this genus. The branches are angular, bearing obliquely-ovate slightly falcate acuminate phyllodia, remarkable in having three longitudinal nerves, connected by transverse ones. The flowers form little round balls of very pale yellow threads, and these grow on stalks shorter than the phyllodes, from two to five proceeding from one axil. From Swan River. Introduced by Mr. Drummond in 1843. Flowers in January and February. Royal Botanic Garden, Kew.

ROGIERA MENECHMA, Planchon. Neighbouring Rogiera (Paxt. Fl. Gard., ii. 41).—Nat. Ord., Cinchonaceæ § Cinchoneæ.—A pretty stove shrub of free-flowering habit, and very closely resembling R. amoena, except in the structure of the flowers. The leaves are broadly-ovate, very downy; the flowers grow in rather loose cymes, and are of a pale salmon-colour. The tube of the corolla is thicker than in R. amoena, the filaments are inserted above the middle, and the style is included; the stigmatic lobes are linear, much longer than in the allied plant. From Guatimala. Introduced about 1848. Flowers in winter and spring. Horticultural Society of London.





From . restore to a

## ERICA LEEANA,—VAR.: VIRIDIS.

Nat. Order .- ERICACEE.

Generic Character.—Erica, Linnæus —Calyx four-toothed or four-parted. Corolla hypogynous, varying—globose, ucceolate, campanulate, or salver-shaped; limb four-toothed. Stamens eight, inserted beneath a hypogynous disk, included or exserted; filaments free; anthers terminal or lateral, distinct or cohering at the base, unarmed, awned, or crested, cells bursting by an orifice at the summit. Ovary four-celled, cells with many ovules; style filiform; stigma capitate, cup-shaped, or peltate. Capsule four-celled, loculicidally four-valved, valves septiferous in the middle, the septa opposite or alternate to the angles of the four-sided or four-winged central placentiferous column, sometimes adnate. Seeds numerous, oval, reticulated.—Shrubs not very common in middle and southern Europe, of vast number of species and forms at the Cape of Good Hope, peculiar in

habit; leaves alternate, opposite, or whorled, acicular, flowers axillary or terminal, with three bracts, close to or distinct from the calyx, the pedicels sometimes provided with involucral leaves at the base.—(Endlicher Gen. Plant., 4313.)

ERICA LEEANA, Dryander.—Lee's Heath.—Leaves rigidly linear, erecto-incurved or spreading; flowers shortly stalked in whorled spikes; bracts approximating to the calyx and half equalling or surpassing it; sepals lanceolate-linear, rather glabrous and clammy; corolla clavate-tubular, rather incurved, ribbed, hairy-scabrous, clammy, a little contracted below the mouth; ovary very downy at the summit.

Var. viridis, Zeyher.—Green Lee's Heath.—Corollas eight to ten lines long, yellowish green, hairy and very clammy. Syn.—Erica viridis, Andrews; Syringodea viridis, G. Don.

ESCRIPTION.—Stem shrubby, erect, the branches mostly simple, erect, and rigid. Leaves in whorls of six, linear, obtusely pointed, spreading, or finally recurved. Flowers arising near the ends of the branches, crowded in whorls from the midst of the leaves, shortly stalked, horizontal; calyx four-leaved, clammy, with lanceolate-linear segments, appressed to the corolla, and with three bracts appressed to itself; corolla cylindrical or somewhat clavate, from three-quarters to one inch long, a little curved, green, clammy, and roughish, the segments of the limb reflexed; stamens eight, capillary; anthers without appendages, included; ovary depressed-globular, downy; style filiform; stigma four-sided.

History.—Native of the Cape of Good Hope, long since introduced into this country, but rare in cultivation. The species appears to be very variable in the size and especially the colour of the corolla. The plant figured is more delicate in habit than specimens in Zeyher's collections, but there appears to be no doubt of its identity with Andrews's *E. viridis*, which we have referred to Leeana, according to the views propounded in De Candolle's *Prodromus*. Our drawing was made last summer, from a fine plant in the collection of the Messrs. Rollisson of Tooting, Surrey.—A. H.

CULTURE.—For the culture of Ericas, we refer to various articles and the Calendars of our previous volumes.

# Begetable Physialogy.

BY ARTHUR HENFREY, Esq., F.L.S., LECTURER ON BOTANY AT St. GEORGE'S HOSPITAL.

ABSORPTION.

An the last paper I briefly considered the more important phenomena presented by young plants during their liberation from the last traces of dependance,—in that stage of existence in which they are forming their first instruments of self-support, at the expense of food provided for that purpose before they became separated from the parent plant. When their rudimentary organs have become developed sufficiently to undertake their appropriate functions, when the root and leaves have arrived at a size and condition which enable them to fulfill the offices connected with nutrition, the independent life may be said to have begun; and with the examination of this we enter upon the consideration of a series of operations of much greater complexity, and upon the investigation of a collection of facts which at present we are by no means able to reduce under settled law and order in our conceptions of them, regular and harmonious as they are in their occurrence in living nature.

With the assumption of a definite form and the acquisition of a certain size, a plant (if it belong to any but the lowest tribes) begins to exhibit a difference of function in its different parts. The portion of the axis growing downward, the root, makes its way into the midst of the sources of nutriment, and becomes exclusively devoted to the absorption of external matters for the support of the whole plant. The stem ascends to push out leaf after leaf, and freely expose them to the light and air, increasing at the same time in bulk, so that it may possess sufficient strength to support the everincreasing weight. Its surface while young partakes of the functions of the leaves; but the main physiological importance of the stem generally consists in its constituting the medium of communi-

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cation between the absorbing roots and the leaves in which the assimilative and respiratory functions are principally performed. This is very evident when we remember the conditions in such plants as the Houseleeks, the Aloes, &c., where the stem can hardly be said to have a distinct existence, the leaves being closely packed upon a small conical body immediately in connection with the roots. Plants could not exist with such a reduction of the root-system; when many leaves are formed there must be abundance of roots to supply them with nutriment. It is true, on the other hand, that the stem may in some cases be of more physiological importance; but this is only when the leaves are so little developed that the stem is obliged to assume their functions, as is the case in the Cactus tribe. But these must be regarded as exceptions to the general rule of the subordinate physiological value of the stem, and as examples of the slight dependance of function upon form which exists in vegetables, compared with that which is met with in the organs of animals.

The root while young is a soft cellular structure, clothed by an epidermis of great delicacy, in which no orifices exist; as it grows older a solid case of wood is formed and increasingly developed in the interior; and in plants that live for a succession of years, the outer portions of this woody structure serve as the channels for conveying up the fluids absorbed by the young roots, which, as they are continually becoming elongated by the development of new cellular substance at the points, are removed further and further from the base of the stem which they supply. Now, as the epidermis of the roots presents no orifices, it is clear that all the food of plants must be taken up in a liquid or gaseous condition. The first question, therefore, in the study of the nutrition of vegetables is, what

are the laws regulating the absorption of fluids by plants?

In the first place, what is the cause of the absorption of fluids by the cellular substance of the roots? Is it dependent upon some peculiar vital attraction, or is it simply a result of the operation of the physical phenomenon of endosmose? The latter opinion is entertained by the majority of botanists at the present day, and indeed the cells of the roots do present all the conditions favourable to such a conclusion. They are filled with a fluid containing mucilaginous matter, rendering them more dense than the surrounding water containing merely a minute quantity of earthy salts in solution; so that there is an attraction exerted upon the latter, drawing it into the interior of the cells. The facts, first mentioned by Saussure, that healthy and diseased or dead membranes possess very different powers of absorption, and that diseased membranes absorb water or weak solutions more readily than those which are perfectly healthy, tend to prove that the absorption does not depend upon the exertion of an active vital power, since we could hardly expect this to be increased by injury to the plants; and on the other hand, the interruption of the healthy conditions may cause a relaxation of the natural tension of the membrane, or a disturbance of the position of the mucilaginous contents of the cells, which may favour the physical process of endosmose.

An important question in reference to the supposed existence of a vital force of absorption is, whether plants are capable of exercising a selection in the fluids which they absorb. It is well known that different plants grown upon the same soil will often present very different mineral components in their ashes, and this can only be explained in two ways: either they absorb substances unequally, or they absorb all that is presented to them like a sponge, and excrete again all that is injurious or unnecessary to them. Saussure made experiments on this point without finding any distinct evidence of a selecting power; but Trinchinetti, by growing different plants in mixtures of chemical solutions, obtained results which appear to indicate the existence of something of the kind. Thus, from a mixture of saltpetre and common salt, Mercurialis annua and Chenopodium viride took up much saltpetre and little salt, while Satureia hortensis and Solanum Lycopersicum took up little saltpetre and much salt. Again, from a mixture of sal-ammonia and salt, Mercuriulis took up much sal-ammonia, and Vicia Faba much salt. Still we must not conclude from these experiments, that the plant has a selecting power, which makes it absorb useful and exclude injurious salts, since an experiment of Saussure's, in which he found that a poisonous fluid solution of sulphate of copper, was more readily absorbed than wholesome nutriment, would tend to show that the effect was dependent on some chemical and physical peculiarity of the substances, and their relations to the cell-membrane and its contents. It is certain that from some cause vegetable membrane is capable of excluding particular substances and abstracting the pure water from the solution, since Fungi have been observed to grow in solutions of arsenic; and, in the experiments of Vogel, Cereus variabilis was watered for ten weeks with solution of sulphate of copper without absorbing any; none was absorbed by the leaves of Stratiotes aloides; and Chara vulgaris vegetated for three weeks in the solution of the same salt without taking up any.

With regard to the theory supported by Liebig, that the plants excrete injurious or useless matter, the experiments of Macaire-Prinsep, from which it appeared that roots give off such substances, have

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not been confirmed; and if not true, there remains only one mode of exerction, namely, the deposition in the leaves which fall off annually; and this will be of course applicable only to perennial plants.

It must be remembered, in considering the phenomenon of absorption, that, in the majority of plants, we do not find a simple and direct endosmotic apparatus; for this there must exist two fluids of different densities, separated by a membranous partition. Perhaps this is only met with in an independent state in the few plants which grow wholly under water. In all others many circumstances concur to influence the simple endosmotic process. The large surface of the leaves exposed to the air evaporates great quantities of liquid, which must have very great effect upon the absorption of fluids by the cells of the roots which supply the leaves with moisture; for the evaporation of the water from the cells of the leaves must render the remaining fluid contents much more dense, and this will excite a much more active endosmotic action here, drawing the thinner fluids from the cells of the stem, and the process will be continued from cell to cell throughout the whole tissue of the plant down to the root-cells. This statement, which is deduced from anatomical facts, is borne out by the observation of the course of events in nature; for Hales found that the quantity of water absorbed by a plant stands in direct relation to the number of its leaves, and that when one half the leaves of a plant were cut off the amount of water absorbed sunk to one half. It is well known, also, that when shoots of Vines are led into a hot-house, and caused to unfold their buds during winter, the roots, situated outside the house, will begin to absorb moisture from the earth.

Liebig has shown also, by artificial contrivances, that evaporation may be made to act in opposition to the force of endosmose, and cause fluids to pass out through membranes into thinner media; and this process is so active in plants that it not only suffices to increase the absorption very greatly, and even under certain circumstances to cause it to commence when not previously in operation, but is even powerful enough when plants have been poisoned to cause them to draw up the poisonous fluids in great abundance through the dead parts of the plant, as has been shown in young trees cut off near the root, and plunged into a solution of pyrolignite of iron, for the purpose of imbuing them with it as a preservative fluid. The leaves, which remain uninjured for some time, go on evaporating their fluids actively, and the exhaustion resulting causes the solution to be drawn up into every ramification

of the stem, although it is clear that it must destroy life in every spot it reaches.

On the whole we may say, from the foregoing considerations, that, although we are unable to explain all the details of absorption by the laws of endosmose, yet it is probable that they are all referrible to them, and that in time the chain of relations may be clearly made out.

## ON THE HABITS ACQUIRED BY PLANTS.

By Mr. J. TOWERS, C.M.H.S. &c. &c.

MONSIDERABLE interest attaches to this subject, on which I propose to offer a few remarks. The U practised gardener in the forcing department of an establishment, if he be a man of observation, and prone to inquiry, must know that if a branch of a Vine, for instance, trained against a wall, be led into a frame or glazed pit, where heat can be applied early in the year, its buds will enlarge, and its foliage, &c., expand long before the other branches in the open air begin to swell; and thus fruit of larger size and finer quality may be obtained two or three months in advance of the usual season. But it is equally true that more time will be required to excite the introduced branch (although the temperature of the pit, &c., be raised to sixty or more degrees) than if the tree had, from its first planting, occupied that warmer situation; or, in other words, had been, year after year, subjected to heat at a certain definite period. As a converse to this rule, if a Vine in a pot, or otherwise, so habituated to heat, be exposed throughout one winter to the open air, it will begin to stir considerably earlier than any other Vine growing in the same aspect, which has never been excited by artificial stimulus. These facts being admitted as first principles, we may refer to the circumstances that were detailed in an article in the Gardeners' Chronicle, and to the elucidatory remark of the editor, who instructs his readers that a branch, or portion of a branch, peculiarly situated, produces its own developements under a stimulus and nutritive power locally, and to a certain extent, inherent in itself. Thus, for example, a branch or shoot of any fruit-bearing tree affixed to a warm flue, shall produce leaves, blossoms, and well-set fruit, even before every other member of the tree shall have made any corresponding advances. I hope that I have correctly expressed the writer's meaning.

When I resided in Berkshire I sometimes visited the gardens at Missenden Abbey, then, and perhaps now, under the management of Mr. John Begbie: on one occasion early in the spring of 1838, after the fearful Murphy winter, when the mercury had fallen to 2° or more below zero, and by which the fig trees in one of the gardens had, in the greater number, been killed to the ground. An Apricot tree stood at some distance from a vinery then at work; a small shoot or two had been led horizontally across the breast of the chimney; and upon one of these there were not only leaves of full size and verdure, but an Apricot nearly an inch long, and quite healthy. The frost had been intensely severe in February, and the cold was considerable at the period when myself and two or three visiting gardeners witnessed the facts stated, and also the comparative torpor of every other portion of that Apricot tree. Again, I planted a Vine from a pot that had been treated in heat, outside of a stove: to my then surprise, it had sent forth strong shoots, with expanding leaves, before the winter had passed, and many weeks before the wall Vines would push.

Thus it appears certain that many, if not all, trees may be educated, and thereby brought to assume precocious, or even late habits, of which men of foresight may avail themselves with considerable advantage. We may also derive some useful information by observing the habits of trees trained against open walls, where the aspects are various; thus, for instance, if the body and major part of a Pear tree occupy the south exposure, and a portion of the branches be led across a right angle, and be then trained against a side facing the east—all circumstances, as to clear sunlight, obscuration from clouds, being nearly the same—a considerable difference between the two may be observed, the south

taking the lead.

The Gardeners' Chronicle, while advocating the theory of locally partial, and particular nutrition, embraced the opportunity thus offered, to direct attention to the temperature of Vine borders. There can be no doubt that if an external border be wet, and become frosted after the Vines within a house shall have produced laterals, and the germs of clusters, some danger of a fatal check will be incurred. But there is one particular condition which should ever be fulfilled—the entire stems—whether the roots stand wholly outside or not, ought to be within the house. Holes or such inlets will not suffice except for greenhouses or unforced late vineries. If the stems be exposed to frost, the sap and elaborated juice must be retarded. A definite rule must then be formed and maintained. Cover with litter or mulch, if you like, and in that case apply the material early in the autumn, and let it be deep; but on no account fail to have the whole length of the stem enclosed, and under the influence of the internal warm air of the house.

## THE BEAUTIFUL IN A TREE.\*

MN what does the beauty of a tree consist? We mean, of course, what may strictly be called an a ornamental tree—not a tree planted for its fruit or its timber, but standing alone in the lawn or meadow, growing in groups in the pleasure ground, over-arching the road-side, or bordering some stately avenue.

Is it not, first of all, that such a tree, standing where it can grow untouched and develop itself on all sides, is one of the finest pictures of symmetry and proportion that the eye can anywhere meet with? The tree may be young, or it may be old, but if left to nature, it is sure to grow into some form that courts the eye, and satisfies it. It may branch out boldly and grandly like the Oak; its top may be broad and stately like the Chestnut; or drooping and elegant like the Elm; or delicate and airy like the Birch; but it is sure to grow into the type form—either beautiful or picturesque—that nature stamped upon its species, and which is the highest beauty that such tree can possess. It is true, that nature plants some trees, like the fir and pine, in the fissures of the rock, and on the edge of the precipice; that she twists their boughs and gnarls their stems by storms and tempests, thereby adding to their picturesque power in sublime and grand scenery; but, as a general truth, it may be clearly stated, that the beautiful in a tree of any kind is never so fully developed as when, in a genial soil and climate, it stands quite alone, stretching its boughs upward freely to the sky, and outward to the breeze, and even downward towards the earth, almost touching it with their graceful sweep, till only a glimpse of the fine trunk is had at its spreading base, and the whole top is one great globe of floating, waving, drooping, or sturdy luxuriance, giving one as perfect an idea of symmetry and proportion as can be found short of the Grecian Apollo itself.

We present this beau-ideal of a fine ornamental tree, in order to contrast it with another picture, not from nature, but by the hands of quite another master.

This master is the man whose passion is to prune trees. To his mind, there is nothing comparable to the satisfaction of trimming a tree. A tree in a state of nature is a no more respectable object than

\* From the Horticulturist (U. S.)

an untamed savage. It is running to waste with leaves and branches, and has none of the look of civilisation about it. Only let him use his saw for a short time upon any young specimen just growing into adolescence, and throwing out its delicate branches like a fine fall of drapery to conceal its naked trunk, and you shall see how he will improve its appearance. Yes, he will trim up those branches till there is a tall naked stem higher than his head; that shows that the tree has been taken care of—has been trimmed, ergo, trained and educated into a look of respectability. This is his great point—the fundamental law of sylvan beauty in his mind—a bare pole, with a mop of foliage at the end of it. If he cannot do this, he may content himself with thining out the branches to let in the light, or clipping them at the ends to send the head upwards, or cutting out the leader to make it spread laterally. But though the trees formed by these latter modes of pruning are well enough, they never reach that exalted standard which has for its type a pole as bare as a ship's mast, with only a flying stud sail of green boughs at the end of it.

We suppose this very common pleasure—for it must be a pleasure—which so many persons find in trimming up ornamental trees, is based on a feeling that trees growing quite in the natural way, must be capable of some melioration by art; and as pruning is usually acknowledged to be useful in developing certain points in a fruit tree, a like good purpose will be reached by the use of the knife upon an ornamental tree. But the comparison does not hold good, since the objects aimed at are essentially different. Pruning—at least all useful pruning—as applied to fruit trees, is applied for the purpose of adding to, diminishing, or otherwise regulating the fruitfulness of the tree; and this, in many cases, is effected to the acknowledged diminution of the growth, luxuriance, and beauty of the tree—so far as spread of branches, and prodigality of foliage go. But even here, the pruner who prunes only for the sake of using the knife, not unfrequently goes too far, injures the perfect maturity of the crop, and hastens the decline of the tree, by depriving it of the fair proportions which nature has established between the leaf and the root.

But for the most part, we imagine that the practice we complain of, is a want of perception of what is truly beautiful in an ornamental tree. It seems to us indisputable, that no one who has any perception of the beautiful in nature, could ever doubt for a moment that a fine single Elm or Oak, which has never been touched by the knife, is the most perfect standard of sylvan grace, symmetry, dignity, and finely balanced proportions that it is possible to conceive. One would no more wish to touch it with saw or axe (unless to remove some branch that has fallen into decay) than to give a nicer curve to the rainbow, or add freshness to the dew-drop. If any readers, who still stand by the pruning knife, will only give themselves up to the study of such trees as these—trees that have the most completely developed forms that Nature stamps upon the species—they are certain to arrive at the same conclusions. A Pollard Willow should be the very type and model of beauty in the eye of the champion of the pruning saw. Its finest parallels in the art of mending Nature's proportions for the sake of beauty, are in the flattened heads of a certain tribe of Indians, and the deformed feet of Chinese women. What Nature has especially shaped for a delight to the eye, and a fine suggestion to the spiritual sense, as a beautiful tree, or the human form divine, man should not lightly undertake to re-model, or clip of its fair proportions.

#### CULTURAL AGENCY OF QUICKLIME.

BY MR. J. TOWERS, C.M.H.S., &c. &c.

DY the term quick-lime, we would include all those conditions in which lime is in a fit state to prepare lime-water. In alluding to these, an error will be obviated into which they are apt to fall who take for granted all that is but too vaguely and incautiously written. Lime hot from the kiln exerts a powerful attraction for water, and hence it destroys raw or green vegetable matters by breaking up their tissues in its greedy search for the watery fluid which they contain: during the chemical action thus set up their constituent carbon is revealed, and the decomposed mass is blackened, or, in fact, burned. This first direct action of hot lime has, in a recent French publication (the Chimie de Cultivateur), been thus erroneously noticed:—"The properties of lime arise from the force with which it attracts carbonic acid, from the atmosphere or soil to which it may be exposed. This attraction for carbonic acid is so powerful, that, if lime be placed in contact with animal or vegetable matters, they are decomposed with great rapidity for the purpose of furnishing it." Really this is too bad, inasmuch as the sentence is not only ill-constructed, but vitiates facts.

Lime does attract carbonic acid from the air; but the time required for its complete carbonation, that is, to convert it to chalk, is so great that it may be kept for weeks or months in a garden pot or

jar, simply covered with a flat slate, and yet retain causticity sufficient to destroy the mosses and lichens which infest the stems of current and gooseberry bushes.

Hot lime also meliorates rich alluvial clays replete with vegetable organic matter.

Hydrate of lime, or, to use the more familiar term, slaked lime, is quickly prepared, as every one knows, by sprinkling hot lime with water. The lime heats, (that is, absorbs, and fixes, and solidifies water,—thus liberating the matter of heat which gave it fluidity), swells, cracks, and falls into powder. Again, by simple exposure to the air, hot lime becomes gradually slaked, attracting and combining with atmospheric moisture: it is then called air-slaked lime, and, though a small portion of floating carbonic acid may have combined and so far carbonated the lime, it still retains its causticity. Fresh lime requires about one third of its weight of water to convert it to dry powdery hydrate.

Lime water prepared with cold water,—if at the freezing, or thirty-second degree of Fahrenheit,—contains from eleven to thirteen grains by weight in the pint (Imperial): its taste is acrid; by it the tint of vegetable blues is converted to green; but it cannot retain its alkaline causticity unless it be kept in closely stopped bottles. The solubility of lime in ice-cold water, and the almost total insolubility of chalk in water at any degree of temperature, furnish the ready means of rendering hard waters comparatively soft; as was proved by Professor Clark of Aberdeen, when he described the processes by which the waters supplied to London might be deprived of the bicarbonate of lime, which renders them so hard as to be not only insalubrious, but wholly unfit for the laundry. Gardeners would do well to investigate and apply that simple process, by which a vast saving of soap, soda, and labour, would be made at the small cost of a minute quantity of fresh hydrate of lime, added to many hundred gallons of very hard water.

The direct application of lime to ground and plants infested by soft molluscs—shelless slugs, and snails, is familiarly known; but not so much as it ought to be: and another fact is, that two applications, one about nine or ten p.m., and the other before sunrise, are required to effectually destroy the vermin: to be repeated several times at short intervals. Both lime and salt act by that affinity for water which each exerts upon moist surfaces: slaked lime is a safe application, but salt would destroy growing vegetables—and none sooner or more fatally than the box edgings of gardens.

I have so far dwelt only upon the minor uses of hot and mild lime. One of the *greatest* moment, however, was announced some years ago, when Professor Rowlandson proved that humic acid, inert peat bogs, and earth glutted with black dung, were attracted and fixed by lime; and in the form of slowly soluble *humate* of lime, converted to a salubrious element of vegetable nutrition. I worked out that writer's facts, and established their veracity. But lime claims pre-eminence in a degree and form that were entirely unsuspected, till revealed by Messrs. Thompson and Way's numerous experiments. Some lime *must* be present in soils to give them the power to *absorb* and *fix manures*. (See vol. ii. 218).

## ON VARIEGATION IN PLANTS.\*

By Dr. MORREN, PROFESSOR IN THE UNIVERSITY OF LIEGE.

CLASSIFICATION WITH EXAMPLES AMONG HARDY PLANTS.

ferent modes or forms in which the variegation is developed, to classify certain of them according to a method which is at once physiological and phytographical. This method is physiological in the sense that it permits us to seize upon all the variations according to which the phenomenon takes place, in showing the relations of the coloured parts with the margins, with the summit, the base, the nerves, and the intervening spaces of the blade of the leaf; it is phytographic in so far as that it establishes a fixed and simple nomenclature, which enables us to express without figure and with precision the exact manner according to which the anormal tint is distributed. The first point of view permits us to conceive the influences exercised, without doubt, by the different organs of the leaf on one another to induce the variegation; and the second enables us to determine the possible combinations among the colours and the variegated parts in a given species.

It is proper to remark that variegation is a different phenomenon from spotting: the one is normal, natural, constant in one species, and characteristic; the other is anormal, exceptional, variable, unhealthy, and expressive of an individual state. Anatomically considered, spotting is further different from variegation; the one has its seat in the diachyma, the other in the skin; the one is profound, the other superficial.

\* From Dodonæa, ou Recueil d'Observations de Botanique. Brussels.

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- \* Action proceeding in a circular manner from the margin to the centre of the leaf.
  - I. Leaves marginate, with a narrow border of white, yellow, pale green, or purple.

A. Border entire, not interrupted.

Viburnum Lantana, var. foliis flavo-marginatis.

Pyrus americana, var. foliis albo-purpureo-marginatis.

Euonymus japonicus, var. foliis albo-marginatis.

Fraxinus excelsior argenteus, var. foliis flavo-marginatis.

Buxus sempervirens, var. foliis flavo-marginatis.

Ilex Aquifolium, var. foliis albo-flavo-marginatis.

B. Margin interrupted.

Quercus Robur, var. interrupte albo-marginatis.

Fagus sylvatica, var. interrupte albo-flavo-marginatis.

Note. The list might be extended, but this kind of variegation is not common.

- II. Leaves margined with white, yellow, pale-green, or purple, to about a quarter or one-sixth of the entire breadth.
  - A. Border without irradiations.

Taxus baccata, var. foliis flavo-limbatis.

Philadelphus hirsutus gracilis, var. foliis flavo-limbatis.

Amygdalus persica, var. foliis flavo-albo-limbatis.

B. Border, with slight irradiations towards the centre.

Quercus Cerris, var. foliis flavo-radiato-limbatis.

Ulmus campestris, var. foliis flavo-radiato-limbatis.

Castanea vesca, var. foliis albo-radiato-limbatis.

Aristotelia Macqui, var. foliis flavo-radiato-limbatis.

Fagus sylvatica, var. foliis flavo-viridi, purpureo-radiato-limbatis.

Staphylea pinnata, var. foliis flavo-radiato-limbatis.

Cornus mascula, var. foliis flavo-radiato-limbatis.

Cornus alba, var. foliis albo-flavo purpureo-radiato-limbatus.

III. Leaves discoid, having only the disk or centre of the leaf white or yellow, the border being green.

Prunus Padus heterophylla, var. foliis flavo-viridi-discoïdalibus.

Euonymus europæus, var. foliis albo (aures) discoidalibus.

Ilex Aquifolium, var. foliis albo-discoïdalibus.

Note. This kind of variegation is very beautiful; but it is rare.

IV. Leaves zoned, in which the disk and the border are green, the one separated from the other by a white or yellow zone.

Symphoricarpus racemosus, var. foliis flavo-albo-zonatis.

Note. This form of variegation has some resemblance to the spotting of the same kind, as in Pelargonium lateripes, Oxalis Deppei, &c. It is very rare and beautiful.

- \* Action proceeding without order, independently of the border, from the nerves of the summit or the base of the blade.
  - V. Leaves maculo-variegated, or spotted irregularly and without order, with white or yellow spots.

    Aucuba japonica, var. foliis albo-flavo-maculo-variegatis.

Prunus aucubæfolia, var. foliis flavo-maculo-variegatis.

Note. The few examples that we cite here prove exactly that variegation is a phenomenon more regular in its mode of action than is commonly believed. In all other forms of variegation the regularity is much greater than in the present instances.

- \* Action proceeding by the influence of the system of nervation on the intervenium, or vice vevsa; so that it proceeds from the discoloured band and the variegated arcole to the lateral portion of the discoloured or variegated blade.
  - VI. Leaves reticulated, in which the intervenium is white or yellow, while the nerves and the veins are green, or *vice versa*.
    - A. Intervenium discoloured, nerves and veins green.

Aucuba japonica, var. foliis intervenio-flavo-reticulatis.

Berberis vulgaris, var. foliis intervenio-flavo-viridi-reticulatis.

Fraxinus Ornus, var. foliis intervenio-flavo-viridi-reticulatis.

Sambucus laciniata, var. foliis intervenio-flavo-reticulatis.

Sambucus racemosa, var. foliis intervenio-flavo-reticulatis.

Amorpha glabra, var. foliis intervenio-flavo-reticulatis.

Note. This is also one of the most beautiful forms of variegation.

B. Nerves and veins discoloured, intervenium green.

Ptelea trifoliata, var. foliis venis-flavo-reticulatis.

Cytisus triflorus, var. foliolis venis-flavo-reticulatis.

Pyrus Malus, var. foliis albo-reticulatis.

Sambucus nigra, var. foliis venis-albo-aut flavo-reticulatis.

Acer campestris, var. foliis albo-reticulatis.

Oxalis acetosella, var. foliis venis-albo-reticulatis.

Geum urbanum, var. foliis flavo-reticulatis.

Note. This is also one of the most beautiful forms of vegetation.

VII. Leaves vittate, striped with longitudinal parallel or converging bands.

Funkia lanceæfolia, var. foliis albo-vittatis.

Hemerocallis fulva, var. foliis albo-flavo-purpureo-vittatis.

Fritillaria Imperialis, var. foliis albo-vittatis.

Convallaria majalis, var. foliis albo-vittatis.

Digraphis arundinacea, var. foliis albo-purpureo-vittatis.

Note. Many other monocotyledonous plants have this form of variegation, which, physiologically viewed, belongs to those in which the influence of the nerves is all-powerful; for in Funkia ovata, for instance, and Convallaria majalis, the nerves only are variegated; while in Digraphis it is the intervenium which is white.

VIII. Leaves marbled, with three or four tints at the upper surface, distributed on the parenchyma between the principal nerves, and following their direction.

Viburnum Lantana, var. foliis flavo-viridi, flavo-marmoratis.

Quercus Robur, var. foliis albo-flavo-marmoratis.

Acer rubra, var. foliis albo-flavo-viridi-marmoratis.

Acer pseudo-platanus, var. foliis flavo-viridi, rubro-albo-marmoratis.

Æsculus Hippocastanum, var. foliis flavo-albo-marmoratis.

Prunus Laurocerasus, var. foliis flavo-viridi, flavo marmoratis.

Cratægus Oxyacantha, var. foliis albo-flavo-rubro-marmoratis.

Ulmus campestris, var. foliis albo-flavo-viridi-marmoratis.

Note. This is the commonest of all forms of variegation; it is frequent in nearly all trees, but in herbaceous plants somewhat more rare.

IX. Leaves or leaflets, white, yellow, or red at one side of the mid-vein, and the other green.

Viburnum dentatum, var. foliis flavo-dimidiatim-variegatis.

Betula nigra, var. foliis flavo-purpureo-dimidiatim-variegatis.

Ulmus glabra microphylla, var. foliis flavo-dimidiatim-variegatis.

Syringa vulgaris, var. foliis albo-dimidiatim-variegatis.

Euonymus europæus, var. foliis flavo-dimidiatim-variegatis.

Rhamnus Frangula, var. foliis flavo-purpureo-dimidiatim-variegatis.

Buxus sempervirens, var. foliis flavo-dimidiatim-variegatis.

Acer campestris, var. foliis flavo-viridi-purpureo-variegatis.

Action proceeding from the base to the summit, from the summit to the base, or by a transverse band, perpendicular to the principal nerves.

X. Leaves with the base only or the apex only discoloured.

A. Discoloured at the base.

Cornus sanguinea, var. foliis basi-albo-variegatis. Cornus alba, var. foliis basi-albo-variegatis.

Cornus mascula, var. foliis apice-albo-variegatis.

XI. Leaves fasciated, having one or several discoloured transverse bands perpendicular to the direction of the midrib.

Cornus mascula, var. foliis albo-fasciatis. Viburnum dentatum, var. foliis flavo-fasciatis.

Action general, pervading the whole of the leaf.

XII. Leaves entirely yellow or white.

Juniperus Sabina, var. foliis albis.

Juniperus communis, var. foliis albis.

Thuja orientalis, var. foliis albis.

Quercus Robur, var. foliis flavis.

Acer platanoides, var. foliis flavis.

Æsculus Hippocastanum, var. foliolis albis.





7- J Barnes or A Sonce

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#### EPISCIA BICOLOR.

Nat. Order .- GESNERACEÆ.

Generic Character.—Episcia, Martius.—Calyx free, five-parted. Corolla hypogynous, funnel-shaped, tube rather straight, gibbous at the base posteriorly. Stamens four, inserted at the bottom of the tube of the corolla, didynamous, included, with the rudiment of a fifth; anthers of the equal stamens approximated, two-celled, suborbiculate, ovate. Ovary free, surrounded by a thin annular disk, expanded into a gland posteriorly, one-celled; placentas two, parietal and two-lobed. Ovules numerous, on long funiculi, anatropous. Style terminal, simple; stigma bi-lamellate. Capsule membranous, two-celled, two-valved; valves placentiferous in the middle. Seeds nume-

rous, oblong. Embryo thick, in the axis of sparing albumen, orthotropous; cotyledons very short, radicle near the hilum, centrifugal.—(Endlicher Gen. Plant. 4164.)

EPISCIA BICOLOR, Hooker.—Two-coloured Episcia.—Hairy, low, decumbent; leaves stalked, cordate-ovate, acute, coarsely serrated, with the veins forming furrows, peduncles about equalling the petioles, axillary, simple or twice or three times divided, slender, hirsute; sepals linear-lanceolate, recurved at the apex; tube of the corolla twice as long as the calyx, the mouth oblique, limb about equally five-lobed, lobes rounded; ovary hairy above.—(Bot. Mag. t. 4390.)

ESCRIPTION.—A perennial herbaceous plant, with very short hairy stems. Leaves large, between ovate and cordate, acute, spreading, somewhat glossy, and clothed with hairs, coarsely serrated, penninerved, coarsely reticulated, the nerves impressed. Petioles short, hairy. Peduncles simple or bi-tri-fid, and bracteated, slender, hairy, or rather hispid, springing from the axils of the leaves, and scarcely longer than the petioles. Flowers inclined, or sometimes erect. Calyx hairy, deeply cleft into five nearly erect linear-lanceolate sepals, recurved at the apex. Tube of the corolla rather short, white, gibbous on one side at the base, dilated above, tumid beneath, spotted with purple within, the mouth oblique; the limb rather large, nearly equal. white, with a broad purple border, deeply five-lobed, the lobes rounded. Stamens inserted near the base of the tube; filaments didynamous, subulate, included; anthers approximated in pairs, with one abortive filament between the two pairs of fertile ones. Ovary free, ovate, hairy above, glabrous and somewhat four-sided below, with a large solitary gland on one side. Style included within the tube of the corolla; stigma of two furrowed spreading lips.—A. H.

History, &c.—This pretty plant was raised, some four or five years since, at the Royal Garden, Kew, from seeds sent from New Granada by Mr. Purdie. It is a free blooming species, associating in habit and general character with the dwarf Gloxinias, Nipheas, and similar plants, gay from the pretty contrast of colours in the flowers, and continuing for some weeks ornamental, owing to the succession of flowers which is produced. It blooms with us during the summer.

CULTURE.—Under the general treatment of Gloxinias, the present species succeeds well. It is, of course, a stove plant, at least requiring stove heat up to the blooming time; and after that is past, should be rested in a cooler, dry atmosphere. The short lateral shoots root freely as cuttings; and these make the best flowering plants.—M.

## THE GENERA AND SPECIES OF CULTIVATED FERNS.

BY MR. J. HOULSTON, ROYAL BOTANIC GARDEN, KEW; AND MR. T. MOORE, F.L.S., &c.

Sub-order-Polypodiacea: Tribe-Pteride.e.

Sect. I.—Chilosoreæ, J. Smith.—From cheilos, a lip, and sorus; alluding to the lip-formed marginal sori.

Reverting to the fundamental principles on which are based the technical distinctions of the various tribes of Ferns, we find that they serve obviously, and very naturally, to divide these plants into two groups: one having the sori naked, and said to be non-indusiate; the other furnished with a membrane which at first completely conceals the sori, and is termed an indusium or involucre. The Polypodicæ and Acrosticheæ are non-indusiate; whilst the Pterideæ are characterized by having a special indusium, produced on the exterior side of the sporangiferous receptacle, with the inner margin free, and having the spore-cases in its axis of attachment or on its inferior disc. This tribe is represented by the extensive genera, Adiantum, Pteris, and Blechnum, of the older authors, and is at once distinguished from Polypodicæ and Acrosticheæ by having an indusium, although it is closely connected to the latter tribe, through Lomaria.

DIANTUM, Linnaus.—Named from adiantos, dry; alluding to a curious property of the fronds, which repel

Sori round, reniform, oblong, or linear, marginal, continuous or interrupted. Indusium venose, formed of a reflexed crenule, reniform, oblong, or linear, according to the more or less entire or crenulate margin of the fronds;

vot. III.

sporangiferous on its under surface, at length replicate. Costa excentric or wanting; veins unilateral, or radiating, forked; venules direct, terminating in the axis of the indusium. Fronds simple, reniform, pinnate, pedate, bipinnate or decompound, from six inches to two or three feet high, usually smooth; stipes and rachis ebeneous; pinnæ generally oblique, truncate, or cuneate at the base, or dimidiate, and soriferous on the upper margin only, petiolate, and usually articulated with the rachis or petiole.—This very extensive and distinct natural group contains upwards of a hundred known species, all of elegant form and graceful habit, their ebeneous slender shining stipes and rachis contrasting admirably with the pinnæ, which are of a very delicate green colour. They have a very extensive geographical range, being found in the tropical and extra-tropical regions of both hemispheres; likewise in Europe, New Zealand, and North America. Their affinity with Cheilanthes and Hewardia (a genus not in cultivation) is evidently extremely close. From the former they are distinguished by the position of the sori, which in Cheilanthes are situated on the apex of single venules in the axis of the indusium, whereas in Adiantum



Fig. 32.

they are placed on the indusium. From Hewardia they are distinguished by the latter having a reticulated venation. Fig. 32 represents a small portion of a frond of A. tenerum (nat. size).

1. A. reniforme, Linnæus.—A dwarf evergreen greenhouse Fern, from Madeira. Fronds simple, round or reniform, glabrous, bright shining green, about six inches high, terminal, adherent to a scaly, somewhat creeping rhizome. Sori oblong, contiguous.

2. A. Wilsoni, Hooker.—An evergreen stove Fern, from Jamaica. Fronds glabrous, one foot long, pinnate; pinnæ ovate or oblongacuminate, coriaceous, shining green, cordate at the base; the sterile ones broad, serrate at the margin, petiolate, persistent and not articulate with the rachis; the fertile ones three to five on each frond. Sori linear, continuous. Fronds lateral, adherent to a creeping rhizome.

3. A. macrophyllum, Swartz.—A very beautiful evergreen stove species, from Jamaica. Fronds glabrous, pinnate, one to one and a half foot long; pinnæ large, sub-sessile, ovate or oblong-acuminate; the sterile lobed and slightly dentate, chartaceous, of a lively green, and unequally cuneate at the base. Sori linear, continuous. This is rather an erect-growing plant; fronds lateral, adherent to a creeping rhizome.

4. A. lucidum, Swartz.—A glabrous evergreen stove Fern, a native of the West Indies and South America. Fronds pinnate, one foot long; pinnæ trapezio-lanceolate, acuminate, coriaceous, bright green, shining, cuneate at the base, the margin serrate. Rachis and

stipes hairy; lateral, adherent to a creeping rhizome. Sori linear, continuous or interrupted.

5. A. obliquum, Willdenow.—A glabrous evergreen stove species, from the West Indies and South America. Fronds pinnate, one foot long; pinnæ ovate-oblong, acuminate, deep green on the upper surface, and glaucous beneath; inferior base truncate, superior auriculate, margin serrate. Sori oblong, linear, numerous throughout each fertile pinna. Fronds nearly all fertile, lateral, adherent to a creeping rhizome. Rachis and stipes hairy.

6. A. lunulatum, Burmann (A. arcuatum, Swartz).—An elegant, deciduous stove Fern, from the East Indies and Ceylon, Africa, and South America. Sterile fronds glabrous, pendulous, pinnate, a foot or more long, rooting at the apex; pinnæ oblong, bright green, lobed on the upper margin, and obtuse at the base. Fertile fronds erect, a foot long, glabrous, pinnate; pinnæ lunate on long petioles, upper ones cuneate at the base. Sori oblong-linear, sub-continuous. Fronds terminal, adherent to a fasciculate rhizome.

7. A. caudatum, Linnæus (A. hirsutum, Bory.).—A neat evergreen stove species, from India, China, Ceylon, and the Mauritius. Fronds linear, hairy, one and a half foot long, rooting at the apex, pinnate; pinnæ oblong, obtuse, cuneate at the base, pale green, upper margin divided into small dilatate segments. Sori small, numerous, one on each segment. Rachis and stipes light brown, terminal, adherent to a fasciculate rhizome.

8. A. fovearum, Raddi (A. intermedium, Swartz.)—An ornamental evergreen stove Fern, a native of the West Indies and South America. Fronds bipinnate, one to one and a half foot long; pinnæ oblong-acuminate; pinnules dimidiate, deep green; the sterile ones membranous, oblong-acuminate, sub-imbricate, cuneate at the base, the superior margin inciso-serrate; the fertile ones dimidiate, oblong-obtuse, sub-imbricate, with a serrate apex. Sori oblong, numerous. Rachis and stipes hairy; lateral, adherent to a creeping rhizome. This Fern varies considerably in cultivation. When growing luxuriantly, it attains the height of two feet; the fertile fronds are erect,

with rather small pinnules, and the sori is solitary, on the upper margin of each.

9. A. brasiliense, Link.—An evergreen stove Fern, from Brazil. Fronds bipinnate, a foot or more long; pinnules oblong, obtuse, membranous; the sterile ones serrate, upper surface light green, and rather glaucous beneath. Sori oblong, linear. Rachis and stipes slightly hairy; lateral, adherent to a creeping rhizome. Perhaps only a form of intermedium or fovearum.

10. A. cristatum, Linnæus (A. striatum, Swartz.).—A dwarf pendulous evergreen stove species, from Jamaica. Fronds glabrous, bipinnate, one foot long; pinnæ linear-acuminate, narrow, six or eight inches long, pendulous;





pinnules small, dimidiate, rigid, obtuse, imbricate, deep green, and truncate at the base. Sori oblong. Stipes dull black, minutely muricated; lateral, adherent to a scaly creeping rhizome. This species is in cultivation under the name of A. villosum.

11. A. affine, Willdenow (A. setulosum, J. Smith).—A neat evergreen stove Fern, from New Zealand and Norfolk Island. Fronds bipinnate, lower pinnæ bipartite, about a foot high; pinnules dimidiate, curved, oblong, obtuse, membranous, tender green, with black bristle-like hairs on the upper surface, superior margin obtusely crenate. Sori punctiform, from four to six on each pinnule; indusium hairy, reniform. Rachis and stipes glabrous; lateral, adherent to a slender creeping rhizome.

12. A. hispidulum, Swartz.—A pretty little evergreen greenhouse species, a native of New Holland and New Zealand. Fronds rather hairy, bipinnate, lower branches bipartite, above pinnate, six or eight inches high, branches small and slender; pinnules small, subrotund or oblong-obtuse, dark green, cuneate at the base, the margins crenate. Sori small; indusium reniform. Fronds lateral, adherent to a slender creeping rhizome.

13. A. pubescens, Schkuhr.—An ornamental evergreen greenhouse species, from New Zealand. Fronds pubescent, one foot high, pedate, branches linear, narrow, acuminate, pinnate, of a deep green; pinnules numerous, dimidiate, oblong obtuse, cuneate at the base, slightly serrate or crenate on the margin. Sori small, numerous; indusium hairy and reniform. Fronds nearly all fertile, lateral or terminal, on a short somewhat tufted rhizome.

14. A. pedatum, Linnaus.—A very elegant deciduous frame or greenhouse species, from North America. Fronds glabrous, a foot or more high, pedate, branches linear, pinnate; pinnules membranous, tender green, dimidiate, oblong-obtuse; cuneate at the base, upper margin lobate, or obtusely crenate. Sori oblong, solitary. Fronds lateral, on a short creeping rhizome.

15. A. curvatum, Kaulfuss.—An extremely elegant evergreen stove Fern, from Brazil. Fronds glabrous, one and a half or two feet high, pedate, branches linear-lanceolate, acuminate; pinnules oblong-obtuse, curvate, imbricate, sub-dimidiate, superior margin inciso-serrate or crenate. Sori solitary, oblong, reniform. Fronds lateral, adherent to a creeping rhizome.

16. A. Cunninghami, Hooker. — An ornamental evergreen greenhouse Fern, from New Zealand. Fronds glabrous, bi-tripinnate, twelve or fourteen inches high; pinnules dimidiate, oblong-obtuse, cuneate at the base, deep green, superior margin inciso-serrate. Sori numerous; indusium reniform. Stipes scaly near the base, lateral, adherent to a scaly creeping rhizome. This species is in cultivation under the name of A. affine.

17. A. Capillus-veneris, Linnæus (A. Moritzianum, Klotzsch).—A dwarf evergreen frame or greenhouse Fern, indigenous to Britain, and common in the south of Europe, north of Africa, the Canaries, and the Cape de Verd Islands. Fronds glabrous, bi-tripinnate, six or eight inches high; pinnules obovate-cuneate, inciso-sublobate, membranous, tender green, serrate at the margin. Sori oblong. Fronds lateral, adherent to a scaly creeping rhizome. This species, although indigenous to Britain, is one of those delicate tender Ferns that cannot be cultivated in exposed places, or on ordinary rockwork; if planted in such situations, it invariably dwindles away, and is soon lost. It grows freely in a close frame or greenhouse, where the atmosphere is kept moist. In the south of Europe, the Channel Islands, and Madeira, being warmer than England, it attains the height of eighteen inches, and is then called A. Moritzianum; but the English plant, if cultivated in a moist stove with a high temperature, will produce fronds of equal magnitude with those from the south of Europe or Madeira, with which they are precisely identical.

18. A. assimile, Swartz.—A very neat and delicately beautiful evergreen greenhouse Fern, from New Holland and New Zealand. Fronds glabrous, slender, tripinnate, a foot or more long; pinnules small, somewhat rhomboidal, cuneate at the base, bright green, and slightly lobed or crenate at the margin. Sori small; indusium reniform. Fronds lateral, adherent to a slender creeping rhizome.

19. A. cuneatum, Langsdorff and Fischer.—An evergreen stove Fern from Brazil. Fronds glabrous, three or four times pinnate, a foot or more high, branches very slender and of a light green; pinnules small, numerous, oblong wedge-shaped, inciso-sublobate, sterile lobes scrrulate, fertile emarginate. Sori small; indusium reniform. This species is one of the most delicately beautiful of the genus; the fronds grow rather erect, and are adherent to a somewhat tufted rhizome.

20. A. concinnum, Humboldt, Bonpland, and Kunth.—A very graceful pendulous evergreen stove species, from the West Indies, Venezuela, and other parts of South America. Fronds glabrous, slender, tripinnate, two to three feet long; pinnules somewhat round or rhomboidal, membranous, tender green, obtuse with crenate lobes, the lowest erect and appressed to the rachis. Sori small, numerous; indusium reniform. Fronds lateral, adherent to a somewhat creeping rhizome.

21. A. tenerum, Swartz.—A very elegant evergreen stove Fern, from the West Indies and Central America. Fronds glabrous, branching, four times pinnate, two to two and a half feet high; pinnules membranous, bright green, rhomboidal, obtuse, inciso-lobate; sterile lobes serrulate, fertile entire. Sori oblong-reniform. Fronds lateral, adherent to a short erceping rhizome.

22. A. trapeziforme, Linnœus: (A. rhomboideum, Schkuhr; A. formosissimum, Klotzsch).—An evergreen stove Fern, from Jamaica and other West India Islands. Fronds glabrous, four times pinnate, two to three feet high; pinnules large, bright green, ovato-rhomboidal, acuminate, the apices serrate and sub-crenate. Sori large, oblong; indusium reniform. This is a very beautiful fern, from the contrast of its large, delicate, green pinnules, with the shining black stipes and rachis. The fronds are lateral, adherent to a short creeping rhizome.

23. A. formosum, R. Brown.—An ornamental evergreen greenhouse Fern, from New Holland. Frond

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branching, four times pinnate, one and a half to two feet high; pinnules small, membranous, rhomboidal, obtuse, inciso-lobate, sterile, serrate, pale green; rachis pubescent. Sori small; indusium reniform. Stipes scabrous, lateral, adherent to a slender creeping rhizome.

THEILANTHES, Swartz.—Named from cheilos, a lip, and anthos, a flower; in allusion to the lip-shaped indusium which covers the fructification.

Sori round, marginal, solitary, or contiguous, often becoming confluent. Indusium sometimes reniform, rarely oblong, and including more than one sorus. Veins forked; venules direct, their apices free, and sporangiferous. Fronds from a few inches to two or three feet long, glabrous, pilose, glandulose, or squamose; segments of the pinnules sometimes very small, concave, and orbicular.—With one or two exceptions, the species arranged under this genus scarcely attain more than a foot in height; they are all of very delicate texture, and are mostly natives of elevated regions in tropical or extra-tropical countries. They are best cultivated in an intermediate house, and



Fig. 33.

should be potted in sandy peat soil, well drained, and watered very sparingly over the fronds; during winter they should be kept rather dry. On account of their proximity to other genera in this tribe, they are often difficult to determine unless in a living state. In the small convex segments of the pinnules with only a few spore-cases, they are analogous to Nothochlæna, but from that genus they are obviously distinguished by having an indusium. From Adiantum they are distinguished by the position of the sori, which is here produced on the apex of the venules in the axis of the indusium, that of Adiantum being on the indusium. Fig. 33 represents a small portion of a frond of *C. viscosa* (nat. size).

1. C. micropteris, Swartz.—A neat dwarf evergreen greenhouse Fern, from Quito. Fronds slender, linear, four to six inches long, and covered throughout with glandulose hairs, pinnate; pinnæ numerous, small, petiolate light green, sub-rotund, concave, and sub-crenate. Rachis and stipes brown, terminal, adherent to a creeping rhizome. Sori consisting of a few spore-cases on each segment, which ultimately become confluent.

2. C. odora, Swartz.—A dwarf evergreen greenhouse Fern, from the South of Europe. Fronds glabrous, bipinnate, about six inches high, of a light green; pinnæ oblong-obtuse, sinuate-pinnatifid, the lower ones distant and pinnatifid. Rachis and stipes scattered over with narrow scales. Sori confluent. Fronds terminal, adherent to a somewhat tufted rhizome.

3. C. microphylla, Swartz.—An ornamental evergreen stove Fern, from the West Indics. Fronds slender, linear acuminate, one to one and a half foot long,

pale green, slightly pubescent, bipinnate; pinnules oblong, rather obtuse; segments roundish-ovate, sterile dentate. Rachis and stipes ebeneous, terminal, adherent to a short creeping rhizome. Sori continuous, confluent; indusium very small.

4. C. micromera, Link.—An evergreen greenhouse species, from Mexico. Fronds lanceolate-acuminate, bipinnate, about a foot long; pinnæ linear acuminate, rather obtuse; segments obovate, deep green, sterile crenate. Stipes rachis and midrib of pinnæ ebeneous, and covered with narrow brown scales; fertile segments concave. Sori continuous, confluent; indusium very small. Fronds nearly all fertile, terminal, adherent to a short creeping rhizome.

5. C. rufescens, Link. A very neat, evergreen, greenhouse Fern, from Mexico. Fronds glabrous, somewhat triangular, from six to ten inches high, delicate green, tripinnate; pinnules oblong, with oblong-ovate rather obtuse segments decurrent at the base. Stipes and rachis black. Rhizome somewhat creeping. This plant is at present very scarce in cultivation; although, in 1840, it was growing freely in the Botanic Garden, Birmingham.

6. C. hirta, Swartz. A very delicate evergreen greenhouse species, from the Cape of Good Hope. Fronds linear, lanceolate, pale green, sub-tripinnate one foot long, and covered throughout with glandulose hairs; pinnules small, oblong-obtuse, pinnatifid; segments crenate. Rachis and stipes brown, terminal, adherent to a rather erect rhizome. Sori distinct, subsequently confluent, on each segment of the fertile frond.

7. C. spectabilis, Kaulfuss: (C. brasiliensis, Raddi.)—A straggling growing evergreen stove Fern, from Brazil. Fronds slender, glabrous, tripinnate, three to four feet long, light green; pinnæ linear-acuminate; pinnules oblong-linear; segments oblong-obtuse, slightly crenate, adnate, and decurrent throughout the whole frond, which is terminal, adherent to an erect fasciculate rhizome. Sori distinct, subsequently confluent.

8. C. tenuifolia, Swartz.—A very tender deciduous greenhouse Fern, from the East Indies and New Holland. Fronds somewhat ovate, tripinnate, one foot long, light green; pinnules linear-acuminate; segments oblong-ovate, deflexed. Rachis, stipes, and midrib of pinnæ brown, and scattered over with narrow scales. Fronds terminal, adherent to a creeping rhizome. Sori round, subsequently confluent; indusium very small.

9. *C. tenuis*, Presl.—An elegant evergreen stove species, from Mexico. Fronds ovate-lanceolate, tripinnate, one foot long, woolly; pinnules oblong; segments small, roundish ovate, cuneate at the base, crenate reflexed and concave. Sori linear consisting of a single row of spore-cases partly concealed in the axis of the broadly reflexed margin of each segment; indusium linear, continuous. Fronds terminal, adherent to a creeping rhizome.

10. C. lendigera, Swartz.—An exquisitely beautiful evergreen stove Fern, a native of Mexico and various places in South America. Fronds lanceolate tripinnate, one foot long, hairy; pinnules oblong-linear; segments very small, obovate, revolute and concave. Sori consisting of two or three spore-cases on each segment, partly concealed by the reflexed margin. Stipes, rachis, midrib of pinnæ, and pinnules densely covered with brown scales. Fronds terminal, adherent to a short creeping rhizome.

11. C. viscosa, Link.—A beautiful evergreen stove species, from Mexico. Fronds triangular, one foot high; branches tripinnate, light green, and covered throughout with viscid glandulose hairs; pinnules oblong-obtuse, pinnatifid; segments of the sterile frond dentate. Sori linear, continuous around every segment of the fertile

frond. Rachis and stipes brown, terminal, adherent to a short creeping rhizome.

12. C. radiata, J. Smith: (Adiantum radiatum, Linnæus).—A very delicate and exceedingly beautiful evergreen species, native of the West Indies and Tropical America. Fronds glabrous, one foot high, digitate; branches linear, pinnate, radiating; segments oblong-obtuse, sub-imbricate, petiolate, articulate at the base, auriculate, with a crenate margin. Sori distinct, often crowded throughout the frond; indusium reniform. Rachis and stipes obeneous, terminal, adherent to an erect fasciculate rhizome.

ASSEBEERA, Kaulfuss.—Name commemorative of J. H. Cussebeer, a German botanist.

Sori round distinct, or continuous and configurations.

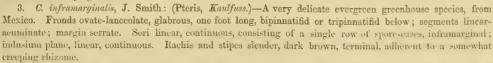
Sori round distinct, or contiguous and confluent, constituting a linear continuous, or interrupted compound marginal sorus. Indusium linear, plane plicate or vaulted, attached transversely across the sporangiferous apices of the venules, rarely inframarginal, sometimes very narrow. Veins forked; venules direct, their apices free and sporangiferous. Fronds from one to one and a half foot long, palmate, pinnate or bi-tripinnate, glabrous, squamose or farinose.—
The species upon which this genus was originally established has a geminate sorus, with a notched or two-lobed indusium; that is, the spore-cases arising from the apex of four venules are included under one inframarginal indusium. There is no fern at present in cultivation which agrees to this character; those we have followed Mr. Smith in placing here are of a similar habit and venation, but in the structure of their sori and indusium are analogous to Cheilanthes or Pteris. Fig. 34 represents a pinna of C. farinosa (full size).

1. C. farinosa, J. Smith: (Pteris, Swartz; Cheilanthes, Hooker.)—An exceedingly beautiful evergreen stove Fern, from Nepal. Fronds glabrous, triangular, one to one and a half foot long, bipinnatifid; segments oblong-obtuse, the upper surface dull green; densely covered beneath with a white farinose powder. Rachis and stipes obeneous; terminal, adherent to a fasciculate erect rhizome. Sori linear, continuous, subsequently confluent; indusium universal throughout every segment

of the frond.

2. C. pedata, J. Smith: (Pteris, Linnæus.)—A beautiful dwarf evergreen stove Fern, native of the East and West Indies, and Islands of the Pacific Ocean. Fronds glabrous, triangular, six to ten inches high, five-parted; segments drooping, linear acuminate, pinnatifid, and of a lively

green. Sori oblong or linear, continuous; indusium narrow. Rachis and stipes ebeneous, terminal, adherent to a somewhat creeping rhizome.



4. C. hastata, J. Smith: (Pteris, Linnaus).—An ornamental evergreen greenhouse species, from the Cape of Good Hope. Fronds glabrous, one to one and a half foot long, bipinnate; pinna cordate, yellowish green, ovate-acuminate or hastate; the margin crenate. Sori linear, continuous; indusium plane. Rachis and stipes dark brown, terminal, adherent to a short creeping rhizome. Two forms of this plant are in cultivation, the one larger than the other, but not otherwise different.

5. C.comeata, J. Smith: (Cheilauthes, Link).—A neat evergreen greenhouse Fern from Mexico. Fronds glabrous, bipinuate, six to ten inches high, of a lively green; fertile pinnacles oblong acuminate, pinnatifid, with the segments narrowed at the base; sterile segments, oblong, wedge-shaped, and serrate at the margin. Sori linear, Rachis and stipes chencous; rhizome somewhat creeping.

AATYLOMA, J. Smith: (Pteridis sp. of Authors).—Name derived from platys, broad, and loos, a margin, in allusion to the broad marginal sori.

Sori linear oblong, continuous, subsequently confluent, occupying a portion of the upper half of the venules, forming a broad marginal band. Indusium narrow, attached transversely to the outer margin of the broad



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sporangiferous receptacle. Veins forked; venules direct, their apices free and sporangiferous. Fronds from one to two feet long, pinnate, bipinnate, or tripinnate, glabrous, pilose, or squamiferous; stipes generally ebeneous; pinnæ articulate with the rachis.—In habit, the species arranged under this genus, with one or two exceptions,



Fig. 35.

vary but little from those of Cassebeera and Adiantum; their principal technical distinction is the presence of a broad sporangiferous receptacle, with the margin of the frond slightly reflexed, and edged with a narrow linear indusium, which is continued, more or less, throughout every pinna or pinnule of the whole frond. Fig. 35 represents a portion of the frond of *P. falcata* (med. size).

1. P. rotundifolia, J. Smith: Forster.—A pretty evergreen greenhouse Fern, from New Zealand. Fronds linear pinnate, one to one and a half foot long, reclining; pinnæ glabrous subrotund, or oblong-elliptical, rather obtuse, cordate at the base, coriaceous, dull green, and slightly crenate at the margin. Rachis and stipes densely covered with brown scales, lateral, adherent to a creeping rhizome. Sori linear, continuous, very broad; indusium very narrow.

2. P. falcata, J. Smith: R. Brown.—An ornamental evergreen greenhouse species, from New Holland. Fronds lanceolate, pinnate, one to two feet high, rather erect; pinnæ glabrous, linear-lanceolate, oblong, bluntly acuminate, falcate, cordate at the base, coriaceous, and of a dull green. Rachis and stipes squamiferous; lateral, adherent to a creeping rhizome. Sori linear, continuous, very broad; indusium very narrow.

3. P. ternifolia, J. Smith: (Pteris subverticillata, Cavanilles).—A rather pendulous evergreen stove Fern, from Mexico. Fronds glabrous, linear, pinnate, one to one and a half foot long, reclining; pinnæ opposite or

alternate, sessile, trilobed, cordate at the base, coriaceous, bluish green, with a cartilaginous margin. Sori linear-continuous; indusium very narrow. Rachis and stipes purple; stipes pubescent, terminal, adherent to a short scaly creeping rhizome.

4. P. calomelanos, J. Smith: Swartz.—A dwarf evergreen stove species, from the Cape of Good Hope. Fronds glabrous, deltoid, glaucous, about a foot long, bipinnate; pinnules deltoid, coriaceous, bluish green, cordate at the base, sub-trilobate, with a narrow cartilaginous margin. Stipes scaly near the base, terminal, adherent to a short creeping rhizome. Sori linear, continued round every fertile pinnule; indusium very narrow.

5. P. atropurpurea, J. Smith: Linnæus.—An elegant dwarf evergreen frame or greenhouse species, native of North America. Fronds ovate-lanceolate, bipinnate, six to ten inches long; pinnules glabrous, oblong or ovate, obtuse, cordate at the base, bluish green, terminal one elongate. Sori linear, continuous, forming a broad band; indusium narrow. Rachis and stipes pubescent, terminal, adherent to a somewhat creeping rhizome.

6. P. cordata, J. Smith: Cavanilles.—A very elegant soft erect-growing deciduous greenhouse Fern, from Mexico. Fronds delicate, bipinnate, one and a half to two feet high; pinnules ovate, cordate-sagittate, membranous, light green, and densely covered with minute hairs. Sori linear, continuous; indusium narrow. Rachis and stipes light brown; lateral, adherent to a thick scaly creeping rhizome.

7. P. sagittata, T. M.: Cavanilles.—A very pretty erect-growing warm greenhouse Fern, from South America. Fronds triangular, bipinnate, a foot and a half to two feet high; pinnules stalked, smooth, glaucous green, cordate-lanceolate, with the margins rolled under so that they become narrowly-triangular or arrow-shaped. Sori linear, continuous, covered by a narrow indusium. Rachis and stipes pale brown, lateral, adherent to a short creeping rhizome.

8. P. flexuosa, J. Smith: Kaulfuss.—A deciduous stove species, native of Peru and Columbia. Fronds three or four times pinnate, and four to six feet long, somewhat twining, with alternate zig-zag pubescent branches; pinnules small, ovate, glabrous, membranous, light-green, deciduous, cordate at the base, the margin cartilaginous. Sori linear, continuous; indusium very small. Rachis and stipes brown, lateral, adherent to a creeping rhizome.

## ATMOSPHERIC ELECTRICITY.

By Mr. J. TOWERS, C.M.H.S., &c. &c.

MEW subjects can be of greater consequence to the cultivator than the present, inasmuch as it involves many, if not all, the great meteoric phenomena which govern the progress of vegetable growth, from that of the development of the seed-germ to the complete expansion of the full-grown tree. Vapours, steam or mist, dew, and the condition of the clouds, are among the most obvious of those phenomena. In the former article, allusion was made to some theoretic statements which are to be found in the *Researches of Electricity*, by Dr. Faraday: a few lines remain to be added, but these are postponed for the present, as an article just come to hand is now before me, from which some extracts will be given, that will tend to throw some light upon every fact derived from actual observation.

Whether we receive, as being more generally understood, the theory of the existence of two distinct electricities, or endeavour to explain all electrical phenomena by supposing that they are dependent upon an excess, or a diminution in the quantity possessed by any substance, certain it is, that two modifications of electricity are produced, or two conditions established, which equally exhibit opposing, attractive, and repulsive powers. Thus, if two jars be charged at the same moment, and by the same number of revolutions, the one from the positive conductor in the front of a cylinder or plate machine, and the other from the negative conductor attached to the rubber, both will be equally charged as to power, but the one will attract any light substance which the other repels, and vice versa. Now, as our artificial machines, by which certain phenomena are rendered visible, can derive their electricity solely from the earth or air, it follows that both the one and the other must be imbued with the ethereal fluid. That being admitted, we now refer to the article "Electricity," as we find it in Morton's Cyclopedia of Agriculture. Want of space enforces abbreviation: -- "The local disturbances which produce thunder storms by no means indicate the amount or intensity of the electricity of the air. Recent observations made by Quetelet, of Brussels, have thrown much light on this subject." As a general result of many observations taken by means of a peculiar ball electrometer, from 1843 to 1848, it was proved that the annual and diurnal alterations of atmospheric quiescent electricity, are very remarkable. "Contrary to expectation it attains its maximum in the coldest months, being least in the hottest part of the year. The following proportional numbers exhibit the different amounts of electricity in the different months of the year." A circular diagram is shown in the article, like the face of a clock, wherein we find the maximum to be represented by No. 605 for January, 378 February, 200 March, 141 April, 81 May, 47 June, 49 July, 62 August, 70 September, 131 October, 209 November, 507 December. Another circular diagram illustrates the electrical changes during the 24 hours of the day. Thus, commencing with midnight, the figure shows the total absence of electricity from that hour till six in the morning, when 17 degrees are marked. At seven o'clock they rise to 27; at eight to 36 (maximum); thence they decline to 27, 20, 14, and to 12 at the hour of noon. At one, p.m., 10; at two, 5; at three, 3; ascending at four, p.m., to 5: then to 11, 18, 24, 30, and 32 at nine in the evening: again declining to 30 at ten, 19 at eleven, and to zero at midnight. "The nature of the wind makes a decided alteration in the amount of electricity in the air:" thus, when the wind is from S.E. to E.S.E., the electricity is at a maximum, or as 312 when compared with 102, the minimum which is produced by a wind at from N.N.W. to North. "The state of the weather also seems to influence materially the quantity of electricity, as is shown by the following observations:-

				S	TATE OF	THE SKY.					
				Cloudy.	Clear.	1				Cloudy.	Clear.
January,				268	1138	July,				41	35
February,				220	493	August,				56	64
March,				129	261	September,	,			42	76
April,				71	149					75	168
May,				46	63					109	220
				36	37						571

"It is, therefore, obvious, that there is much more electricity in clear than in cloudy weather. In a fog or snow the amount of electricity is always great, approaching the mean maximum of the cold months, and double that of rain. In fog, the electricity of the air equals 64°; in snow 64°; in rain 35°. These interesting results of Quetelet, obtained by careful investigations at Brussels, form the first precise knowledge of the electricity of the atmosphere." Thus far I have ventured to trespass, faithfully as to the matter, where curtailment has been required.

The simple, great question as to the existence of electricity in the atmosphere, is decisively solved. That it is derived from the Sun, as the great fountain and source of light, electro-magnetism, the actinic or chemical principle, and of heat, as an effect or result of chemical disturbance, is a problem, the solution of which also can searcely be doubted. A few remarks, therefore, suggest themselves, with which I bring this paper to a close. Combining the several data furnished by Quetelet, as above, particularly those which refer to a state of fog or mist, I beg to recall the reader's attention to that passage in the first article upon electricity (p. 88), which, on the authority of Dr. Faraday's *Experimental Researches*, recited the immense volume of electricity that is required to decompose one grain of pure water, and to develope its elementary gases—a volume equal to that of a powerful flash of lightning!

When water is decomposed by an electric current, and its hydrogen and oxygen collected separately, the volume of the former is seen to be a very little above twice that of the latter, yet in point of weight, the hydrogen may be estimated at only 1-16th of the oxygen, in round numbers, or as 2.14 grains are to 34.2 grains; per 100 cubic inches. Hydrogen is the lightest of all known substances that pos-

sess appreciable weight: it therefore may be assumed that the vastness of its bulk, when compared with its absolute weight, depends upon the extremely minute division of its atoms, occasioned by the power of some repulsive agent. Oxygen gas is a fraction heavier than atmospheric air; and in the decomposition of water it also assumes the gaseous form, subject to a similar repulsive power. When the two gases, in the above proportions to form water, are blended together, they explode with violence, on passing the slightest electric spark, and the equivalent quantity of pure water is reproduced. If we admit that these phenomena, connected with the extrication of an intense flash of light, are established as facts which cannot be disputed, then, with all deference to the high authority of Dr. Faraday, I venture to suggest that the volume of electricity, which develops the two elements of the grain of water, combines specifically with their bases; one electricity with the base of hydrogen, and the other electricity with the base of oxygen, in equivalent proportions exactly as required to bring each to that condition of gaseous repulsion in which it invariably exists.

If fogs and mists consist of watery particles kept, by a sovereign law of nature, in a state of repulsion by a definite volume of positive electricity; and again—if, in fact, as Quetelet tells us, his announcement comprises all that, up to the present time, we really know of atmospheric electricity, the electric condition of haze and fogs partially reveals the cause of one of those phenomena which frequently are observed in sultry weather—namely, an afternoon thunder-storm after a dense morning fog. It is well known, that if the mist begins to rise about nine or ten o'clock in the morning, under the influence of a powerful sun—breaks and disperses itself like a body of steam, its particles becoming more rare and attenuated, till at length they vanish into thin air—a serene and brilliant day will certainly follow: thus it frequently happens in the harvest weather of August. If, on the other hand, the mist becomes condensed into cloudy masses about the mid-day hour, thunder approaches, and a storm usually follows before six o'clock, p.m.

Electrical facts are certain: theories—even those which are suggested by the observations of M. Quetelet—must be received with the utmost caution; yet we know enough, and are in possession of facts sufficient to invite our most serious attention to electric science, and to render us perfectly confident that the grand ethereal solar element which we term electricity is (if not the prime) one of the agents of all the phenomena of vegetable life.

## NATURAL MODEL FOR ARTIFICIAL LAKES.\*

IF the improver will recur to the most beautiful small natural lake within his reach, he will have a subject to study and an example to copy well worthy of imitation. If he examines minutely and carefully such a body of water, with all its accompaniments, he will find that it is not only delightfully wooded and overshadowed by a variety of vegetation of all heights, from the low sedge that grows on its margin to the tall tree that bends its branches over its limpid wave, but he will also perceive a striking peculiarity in its irregular outline. This, he will observe, is neither round, square, oblong, nor any modification of these regular figures, but full of bays and projections, sinuosities, and recesses of various forms and sizes, sometimes bold, reaching a considerable way out into the body of the lake; at others, smaller and more varied in shape and connexion. In the height of the banks, too, he will probably observe considerable variety; at some places the shore will steal gently and gradually away from the level of the water, while at others it will rise suddenly and abruptly in banks more or less steep, irregular, and rugged; rocks and stones, covered with mosses, will here and there jut out from the banks, or lie along the margin of the water, and the whole scene will be full of interest from the variety, intricacy, and beauty of the various parts. If he will accurately note in his mind all these varied forms, their separate outlines, the way in which they blend into one another, and connect themselves together, and the effect which, surrounding the water, they produce as a whole, he will have some tolerably correct idea of the way in which an artificial lake ought to be formed. Let him go still further now in imagination, and suppose the banks of this natural lake, without being otherwise altered, entirely denuded of grass, shrubs, trees, and verdure of every description, remaining characterized only by their original form and outline. This will give him a more complete view of the method in which his labours must commence; for, uncouth and apparently misshapen as those banks are, and must be when raw and unclothed, to exhibit all their variety and play of light and shadow when verdant and complete, so also must the original form of the banks and margin of the piece of artificial water-in order finally to assume the beautiful or picturesque-be made to assume outlines equally rough and harsh in their raw and incomplete state.

\* From Downing's Landscape Gardening.





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#### SEEDLING NARCISSI.

Nat. Order .- AMARYLLIDACE.E.

Generic Character.—Narcissus, Linnæus.—Perigone corolline, superior, salver-shaped; tube sub-cylindrical, straight; limb six-parted, the lobes equal, spreading, or reflexed. Crown of the throat (or nectary) funnel-shaped, bell-shaped, or rotate, entire or lobed, shorter or longer than the tube. Stamens six, inserted in two rows at the summit of the tube of the perigone, below the crown, included; filaments very short, free or adherent to the tube; anthers oblong, incumbent. Ovary inferior, three-celled. Ovules numerous, in the central angle of the cells, in many rows, horizontal, anatropous. Style thread-like; stigma obtuse. Capsule membranous, obtusely three-sided, three-celled, loculicidally three-valved. Seeds numerous or few, somewhat globular, with a black, wrinkled testa.—Mediterranean herbs, with tunicated radical bulbs; the scape round or angular, spathe of one leaf, split in front; flowers showy, white or yellow, very often nodding.—(Endlicher Gen. Plant., 1289.)

Narcissus foculiformis elegans (fig. 1).—Flowers large; segments of the perianth more than twice the length of the cup, somewhat undulated, creamy white; cup cyathiform, with a crenulate nankin-coloured margin; spathe narrow, much clongated.

N. Leedul (fig. 2).—Flowers large; segments of the perianth broadly and obtusely oval, about twice the length of the cup, yellow, spreading, plane; cup between cyathiform and cupulate, deep yellow, the margin indistinctly lobed, and of a deep, bright orange colour; spathe somewhat elongated.

N. MAJOR SUPERBUS (fig. 3).—Flowers very deep yellow; separents ovate spreading; scarcely equalling the broad campanulate cup which is plaited, deeply lobed, and spreading at the margin; spathe short, obtuse.

ESCRIPTION, History, &c.—The fine varieties of Narcissus represented in the accompanying plate are seedlings raised by E. Leeds, Esq., of St. Ann's, Manchester, a gentleman who has been for many years engaged in the cross-breeding of this tribe of plants, and who has originated many distinct and beautiful varieties. Those now figured, along with some other very handsome seedlings, which we shall publish shortly, were most obligingly sent to us last April by Mr. Leeds, who gives the following account of their origin:—The variety poculiformis elegans, was obtained from poculiformis (montanus) crossed with angustifolius or poeticus. N. Leedsii, differing chiefly from incomparabilis in the colour of the margin of the cup, was produced from major crossed with poeticus, which latter has communicated to it the deep orange ring. N. major superbus is a seedling from major, or Ajax maximus:—

"There is no end," writes Mr. Leeds, "to the varieties and elegant forms that may be obtained. It is quite clear, however, that incomparabilis is no species. I think bicolor is not a species; and that the number of species is very small. The late Dean of Manchester, in his papers on this tribe, mentions N. montanus (or Tros poculiformis) as being difficult to obtain seeds from. I have three crops of seedlings from this, crossed both with long and short-tubed kinds: it will cross with Ajax of all sorts, with poeticus and angustifolius, and, I think, with the rush-leaved species. Calathinus never seeds with me, but its pollen fertilizes the long-tubed species. Bicolor seeds occasionally, but not freely; I have varieties from this with angustifolius, poeticus, and poculiformis; also pumilus: they are all very distinct and curious. Moschatus and tortuosus seed pretty freely; they will cross with poeticus, poculiformis, and any of the long tubed kinds, and the produce is always beautiful. I think much remains to be done in the production of fine hybrids of this beautiful tribe of plants; and it may be mentioned these are not ephemeral productions, like many modern florists' flowers, but will last for centuries with very little care, as the common kinds have done in our gardens."

CULTURE.—The ordinary culture of this hardy race of bulbous plants is so well understood, that we need not occupy space with its details. It will be more useful to introduce the following hints on the raising and treatment of seedlings, for which we are indebted to Mr. Leeds:—

"To obtain good varietics, it is needfal the previous season, to plant the roots of some of each kind in pots, and to bring them into the greenhouse in spring to flower, so as to obtain pollen of the late flowering kinds, to cross with those which otherwise would have passed away before these were in flower. With me, the plants always seed best in the open ground. When the seed-vessels begin to swell, the flower stems should be carefully tied up and watched until the seeds turn black. I do not wait until the seed-vessel bursts, as many seeds in that case fall to the ground and are lost, but take them off when mature with a portion of the stem, which I insert in the earth, in a seed-pot or pan provided for their reception. I place them in a north aspect, and the seeds in due season are shed as it were naturally into the pot of earth. I allow the seeds to harden for a month on the surface, before covering them with half an inch depth of sandy soil. The soil should be two-thirds pure loam, and one-third sharp sand; the drainage composed of rough and turfy soil. In October, I plunge the seedpots in a cold frame facing the south; and the young plants begin to appear in December and throughout the winter according to their kinds and the mildness of the weather. It is needful, in their earliest stages, to look well after slugs and snails.

"The seedlings should be protected from frosts, but should have abundance of air, or they will soon draw. As soon as they will stand exposure, plunge the pots under some sheltered wall or hedge, and they will form their first bulbs. Let them become dry in summer, and, if it be a wet season, turn the pots on their sides until the time for them to grow again. Let them remain in the seed-pots, and top-dress them with fresh loamy soil. When the bulbs are two years old, prepare, in an open airy situation, a bed of good loam mixed with sharp sand; prepare the bed as for Tulips, &c., covering the entire surface with sand, in which the bulbs should be embedded; plant the roots in rows three inches apart, and each root one inch apart in the row. They will stand three years in this bed, when they may be finally removed into a fresh bed of similar soil to flower: a few will flower the fifth year, but the greater portion not until the seventh. I do not take up the flowering roots oftener than every third season; but top-dress the beds every autumn. A little thoroughly decayed hotbed manure, mixed with the surface soil, aids them to produce fine flowers, but it must be well decomposed or it will do harm. The beds should be well drained, the prepared soil at least two feet deep, and the situation sheltered from north and east winds, which do much damage to the flowers."

When the strength of the flowering bulbs is an object, they should not be permitted to produce seeds, except such as may be actually required, as in hybridizing experiments, or for the purpose of increasing the stock of any rare kinds. This, indeed, is a general principle in the culture of flowering plants, but is sometimes overlooked in practice. Nor, in transplanting, should the bulbs be kept out of the ground longer than sufficient to dry and rest them.—M.

# Garden Vints for Amateurs.

JF the directions of preceding months have been properly carried out, the main business of the crop-A ping season will have been completed, so that the gardener's hands will be at liberty to attend to those operations, upon the due performance of which the successful management of a garden in a great measure depends. First among these, timely and sufficient watering of all such plants as require it is most important, for whether the plants be growing in pots, or have free root-room in the open ground, the same rules prevail, and must be observed, viz., to soak the whole mass of soil thoroughly whenever the plants require water. If the ground is hard, loosen it up, or make a few holes in it several inches deep, with the point of a thick stick. The water also should be warm, that is, it should not be used fresh from a cold spring; but it should be pumped some time previous to using, and be exposed to the atmosphere, so as to get warmed by the sun. The use of gutta percha tubing for horticultural purposes can scarcely be over-rated, for if there is a head of water, or a force pump, or fountain, the water may be forced almost to any distance at a trifling cost, and by piercing a piece of tubing, the water may be dispersed like a gentle shower for hours together. A neighbour of ours has a length so pierced, which he places between his crops, say two rows of peas; the water rises to the height of five or six feet, and falls like a gentle shower upon the crop for hours together, thus soaking the ground thoroughly, and imitating nature by keeping the atmosphere and the root moist at the same time. In the same way a bed of strawberries, a wall of trees, groups of flowers, or even the lawn is thoroughly soaked, without any more trouble than that of placing the tube and turning the water on. In this instance the water is served from the water works, and is always on the main. Another friend has attached tubing to his fountain, from which water is forced to every part of the garden. Contrivances like these are great aids to the gardener; they economise time, and offer facilities for insuring crops and cleanliness, which cannot be too highly estimated. If the ground requires enriching, it is only necessary to sow some guano thinly over it prior to turning the water on, or to give a good soaking of liquid manure a short time before turning the water off, so that it may be diluted, and thoroughly washed to the roots of the plants. All suburban gardens may be watered in this way, and the expense, as compared with the gratification of seeing plants flourish, is not worthy of consideration, indeed, for ordinary gardens, no extra charge would be made.

In the flower garden, complete the bedding out as quickly as possible, and attend rigidly to training and nursing the plants afterwards, so as to induce them to start vigorously, and cover the beds in a short time. Roses are much infested with the grubs this season, and if they are not attended to immediately, the chance of a good bloom will be much decreased. Water the beds directly the buds begin to expand, plenteously with liquid manure, and syringe them occasionally, to check insects. In the herbaceous borders many plants will require training and staking; but do not bundle them together in the broom fashion, but rather thin out the weak shoots, so as to give the others room to amplify,

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and form fine specimens, for there is no reason why herbaceous borders should not contain specimens as fine as those in pots. Plant out Phloxes, Antirrhinums, and such like things, taking care to enrich the borders properly before doing so. This is a good time also to propagate many herbaceous plants; such things as Campanulas, Phloxes, Enothera macrocarpa, of which strong cuttings may now be procured, will strike readily under a hand glass in a shady situation. Put in cuttings also of good Wallflowers, and sow in a suitable place a good collection of the finer kinds of bicunials and perennials, and a good breadth of Wallflowers of various colours for transplanting in the autumn.

Newly planted shrubs, or American beds, will be much benefited by a mulching of short grass; and indeed, should the weather prove dry, and water be scarce, a slight mulching of grass to the flower

beds will be of great service.

Among florists' flowers the Tulips will be in full bloom, and Pinks and Ranunculuses are advancing rapidly. Attend them properly with water, and take care to thin the Pinks when the flowers are produced too plenteously. Ease and tie the pods of the best flowers as they advance towards blooming; slight India rubber bands will be found very useful and convenient for that purpose. Mulch the Heartsease beds and give good soakings of manure water. Dahlias will require much the same treatment, and Carnations and Picotecs will require staking and training. Auriculas and Polyanthuses will be benefited by partial shade. Trap earwigs and wireworm, and destroy insects of all kinds.

The directions of last month are still applicable to plants in-doors,—the same general rules, as to watering, training, ventilating, and cleanliness, still hold good, and will do so throughout the season. Hardwooded plants, as they go out of bloom, must have the seed-pods removed, rude growth must be curtailed, and they must be started immediately into fresh growth. This remark applies more immediately to Azaleas, the finer kinds of which it is indispensable to start into growth so as to get the flowers set early in the season. They must be kept close if you wish to increase them in size; syringe them daily, and give, if the pots are full of roots, good soakings of manure water. Camellias which have completed their growth must receive more air, and, as soon as the buds begin to set, they must be removed to a shaded situation in the open air.

Young stock of stove plants intended for winter blooming, Balsams, Gloxinias, Achimenes, &c., must be encouraged by a nice moist atmosphere and plenty of heat and air, and any plants which require it must be shifted without delay. Ply the finger and thumb in curtailing rude growth, and

train the plants as they require it.

A good stock of Fancy and other Pelargoniums should now be started for autumn blooming, and, if the first named could be placed in a frame under a north wall, the blooming principle will not be so strong as if they were in full light. Remove the flower buds as they appear, and look the plants carefully over every week to remove decaying leaves. Scarlet Pelargoniums must also be prepared for autumn blooming; they require to be potted in good soil, and must be placed in the full sun to mature their succulent growth. Now is a good time to strike Chrysanthemums, for it is better to start them late and keep them growing afterwards, than to strike early and let the plants get cramped in small pots. Where small blooming plants are required in quantity, some old plants planted out now and layered in July, the tops of the shoots being left just out of the ground, will make fine bushy specimens for small pots. Give them, if necessary, plenty of manure water. Plant out, if not done previously, tree and other Violets, in light rich soil in a shady situation; and any old plants of Roses, &c., which have been forced, may also be planted out to gain strength.

The directions of last month will still apply in the Forcing and Kitchen Garden: give plenty of air and water to all growing crops, decreasing the supply of the latter as the fruit approaches maturity, and keep a look-out for insects, more especially upon wall-trees. Proceed with disbudding and nailing the latter, and thin the fruit if necessary. Sow successional crops of Peas, Beans, French Beans, Cabbage, Cauliflower, Cape Brocoli, Spinach, Turnips, Radishes, Lettuce, &c., Carrots and Onions for drawing young, and such other crops as may be required. Attend to Ridge Cucumbers and Vegetable Marrows, and keep every part of the garden and grounds clean and neat. Let not a

weed be seen in any part .-- P.

## VISITS TO REMARKABLE GARDENS.

REDLEAT.-W. WELLS, Esq.

IN our preceding notices of this beautiful place, we have endeavoured to point out some of the peculiar characteristics of its seenery, and the views which we now publish represent, one a very beautiful garden scene, and the other the richness of the natural landscape as seen from the drawing-

room windows. The strong contrast of the two, the highly artistic character of the first, and the rich natural beauties of the other, is very remarkable; and one would hardly expect to find views in such strong contrast so closely associated. Kent, however, is a county rich in those natural beauties of "hill and dale, wood and waterfall," and Redleaf certainly stands upon one of its choicest and most lovely spots. More extensive views may be found, as at Linton, but they are not so rich in contrast, neither are they so richly wooded, as at Redleaf.

The first view is the Rock Garden, as seen from the lower part of the lawn, with the shrubbery and groups of American plants, advancing and retreating in the most natural and picturesque manner.



One remarkable feature and beauty of this lawn is, that it is not intersected by walks of gravel, and in no part of the place are they obtrusive. In the Rock Garden the walks are formed of rough slabs of stone, so arranged as to have the appearance of cropping out naturally; and they are so connected with the rock-beds and banks, as to cheat the observer with the belief that they were not formed by man. The beds in this garden are formed of large edgings of rough stone, many of the stones being covered with lichens and mosses, and rare Alpine plants and Ferns spread wildly over others. In one place the young glossy fronds of Osmundas, and other Ferns, may be seen growing in their native luxuriance, while close by large patches of Cypripedium Calceolus are blooming most magnificently. The plants in this garden have been selected so as to present considerable variety at all seasons, and even when they are all out of bloom, in the depth of winter, there is such a diversity of foliage and character of plants, as to give the place a very interesting appearance. Shrubs, especially of the choicer American kinds, abound in this garden, more especially upon the rocky precipices, and among them may be observed the wild Bramble, scrambling in native freedom among their branches. One of the most remarkable shrubs, and which covers an entire bed, is Juniperus Sabina repens, a plant which it is said formed the nightly couch of poor Douglas many times, when wandering in North America; nor could a much better natural bed be found, for it is elastic as a spring-mattress, and

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#### VISITS TO REMARKABLE GARDENS.

clean and swect as new-mown hay. Plants of Cotoneaster, Berberis of various kinds, Mahonia, Garrya, Cistus, and Helianthemum abound, and occasionally rare Pinuses, of the dwarfer kinds, present themselves side by side with Vacciniums, Azaleas, Rhododendrons, Andromedas, hardy Heaths, &c., thus forming splendid groups, and presenting a regular succession of flowers. Californian annuals, half hardy plants, and Dahlias, are planted out in the summer time, so that in the autumn, as well as spring and early summer, the garden is rich in floral beauty. We doubt, however, the propriety of planting Dahlias in this garden; their foliage and habit are too coarse, and the flowers too gaudy for such a situation; in fact, it is a place where one would not expect to find them, and hence is inappropriate.

This garden is quite unlike anything we have before seen, but in localities where stones abound, a man of taste might readily form an equally interesting, though of course not so natural a garden. The idea, however, is worth copying, and might be turned to account in many situations, where a more polished style could not be introduced. Perhaps, however, the thing which strikes one the most forcibly at Redleaf is the strong contrast of the scenery, the constant stepping upon something unexpectedly, and being delighted at every turn. As we have before remarked, the mansion has a very plain appearance; yet enter it, and at the very first step you are surrounded by some of the brightest creations of Landseer, and other eminent artists; proceed, and as you pass from room to room, and while you find the furniture and decorations of the most unpretending character, each apartment presents paintings and other articles of virtu, of the most valuable and recherche description: pass to the drawing-room window, and the glorious view pourtrayed in the engraving presents itself, which is thus described by the



late Mr. Loudon:—" Entering the house from the bay of the drawing-room window, the visitor is struck with astonishment at the extent of the prospect, and at the fine reach of the river, beyond which, up the valley, he can see nearly to Godstone, where some trees, on the summit of a hill above that town, mark its situation. If, from the centre window he turns his head to look through the window on his right hand, he sees the whole range of the Redleaf rocks; and if he turns to the left hand window, he sees another reach of river appearing beyond a wood. The surface of the water of the river is probably two hundred feet below the level of the drawing-room floor, from which it is seen; the chain of causeway rocks one hundred feet, and the cottage and wood rather lower. The effect of the woodman's cottage, which may be described as one of the aboriginal cottages of the country, is exceedingly good, as seen from the drawing-room, by the strong contrast which its humble appearance and the associations connected with it, afford to the richness and high art displayed in the house. In this extensive view no gentleman's house is to be seen, no church, and scarcely a farm house or cottage, so completely are almost all the objects of art concealed by the hedge-row trees." At Redleaf the refined taste of its late proprietor is apparent at every step, not only in the design of the garden, and the collection of trees and shrubs, but also in the appropriateness of the sites generally chosen for planting them. We doubt not, however, but the present Mr. Wells, assisted by his clever gardener, Mr. Cox, will still further improve it, by the removal of some of the trees and shrubs where they are too thick, and by such other alterations as may tend to embellish the place. We cannot close these remarks without advising our gardening friends to visit Redleaf, nor without thanking Mr. Wells for his condescension in allowing us to make the sketches which illustrate this series of articles.

#### PROFESSIONAL AND MORAL TRAINING.

HINTS ADDRESSED TO YOUNG GARDENERS.

By Mr. W. P. KEANE, AUTHOR OF THE "BEAUTIES OF SURREY," AND "MIDDLESEX."

MHERE is nothing in nature so truly miraculous and adorable, as that the endless and beneficent a variety of results which we see, should spring from such simple elements. The process of analyzing the facts learned by observation and experiment, so as to deduce from them the general circumstances in which they bear resemblance, is termed the truth, or law, or scientific principle under which the facts are classed. Now, while this process is that which leads to the highest objects of philosophy, it is also that by which all the common knowledge of the course of nature is obtained by ordinary minds. Facts are to the mind what food is to the body; on the due digestion of facts depend the strength and wisdom of the latter, just as vigour and health depend on the former. The most successful in practice will be the gardener who has assimilated to his understanding the greatest number of facts.

The great philosopher, Lord Bacon, we read, collected a great number of books on gardening and rural affairs, but finding them destitute of the information he sought, he ordered that every one of them should be burned, remarking—"In all these books I find no principles; they can, therefore, be of no use to any man: he must get principles for himself, or he must go on till the elements have instructed him, and in either case he can stand in no need of books like these." Thanks to the experience and research of a few philosophers of the present century, we are enabled by the writings of Sir Humphrey Davy, Mr. Knight, and Liebig, to take a comprehensive view of the agents by which vegetable life is influenced, and to trace effects to their causes. It is a beautiful fact, that in nature there is always a unity of operations, and a regularity of connection between cause and effect, which is the more perceptible the more minute the investigation. In the language of philosophy, certain antecedents being given, under similar circumstances, corresponding consequents always ensue. Investigate one useful experiment in horticulture through the different agents by which success is obtained, and the great variety of phenomena will be connected by a small number of general principles, by the help of which we are able, from the knowledge of a few facts, to form certain conclusions respecting a multitude of others.

Let us take any one fruit-tree, flower, or vegetable, and follow the course of its life from the embryo state to maturity; it will afford a type of the circumstances, substances, and influences indispensably necessary for each and every one of the whole vegetable family in all parts of the world. From the majestic Oak of the forest to the creeping Strawberry plant, through the various gradations from the highest to the lowest in the vegetable kingdom, the same influences are at work, all tending

by similar means, under various modifications, to produce the same results.

When we see trees, plants, and vegetables growing with such rich luxuriance after a fine Mayshower, we ask ourselves to trace effects to their causes. The rain we saw to be the immediate cause. That rain was supplied by the clouds; the clouds were formed of exhalations or vapours raised from the earth; these exhalations were produced by the heat from the sun, which is the animating principle of vegetable life. The sun is, therefore, the source of heat, light, and life. Deprive trees, plants, and vegetables of light, and the best-flavoured fruits become insipid, plants of the richest colours assume an ashy whiteness, and the most acrid vegetable grows tasteless; then, all nearly agree in the qualities of their juices. It is only when under the direct influence of light that they acquire their peculiar properties as to colour, perfume, and flavour. It is on the leaves and succulent stems of plants that light chiefly acts, and it is in those parts where the proper juices that give colour, flavour, and the other characters peculiar to plants, more especially reside; they are the oils, volatile and fixed, gums, balsams, and turpentines, the alkalies and acids, the earthy and saline compounds, and the tannin and extractive principle found in the sap or proper juices. It sometimes happens in America, that clouds and rain obscure the atmosphere for several days together, and during that time the buds of extensive forests expand themselves into leaves; these leaves assume a pallid hue till the sun appears, when within the short period of six hours of a clear sky and bright sunshine, their colour is changed to a beautiful green. A writer in Silliman's Journal mentions a forest on which the sun had not shone for twenty days. The leaves, during that period, had expanded to their full size, but were nearly white. One forenoon the sun began to shine in full brightness: the colour of the forest absolutely changed so fast that he could perceive its progress. By the middle of the afternoon, the whole of these extensive forests, many miles in length, presented their usual summer dress. It is reasonable to inquire how such magical effects were produced. The answer will apply with equal force to all fruit-trees, plants,

and vegetables, which are influenced by the more slow but regular change that light performs in the whole system of vegetation. In the absence of the rays of light, the leaves inhaled the oxygen of the atmosphere; and it was not until the solar light had shone that the oxygen was expelled by decomposing the carbonic acid gas, when the carbon (the cause of the green colour) was fixed in the tissues of the leaves. We constantly see the same thing occurring in the vegetable kingdom; the example is a general one. If we deprive a plant of light, we deprive it of the power of fixing carbon; it is on the direct influence of solar light that its fixation of that element depends. Deprived of light, it will not only cease to fix carbon, but it will continue to excrete it, and the result is a weak and watery specimen of mismanagement. But take another plant, treat it in all particulars like the first, with the single exception of exposing it to the genial influence of light, and by giving it the power of fixing abundance of carbon in its tissues, it will be a fine healthy specimen to prove the advantage of light as a great principle, upon which the proper cultivation of plants and vegetables depends.

## NOTES CULTURAL, CRITICAL, AND SUGGESTIVE.

Mildew on Plants.—In our preceding volume we noticed two sulphurators for horticultural purposes,



and we have there stated our opinion of their great utility. We have now before us Mr. Epp's Registered Sulphurator, and for the purpose a more useful machine can scarcely be conceived. It is well made, strong, and very powerful, and with it an ordinary-sized greenhouse may be filled with clouds of sulphur in a few minutes. All who have used it speak highly of it, and for

our own part, we regard it as an indispensable article to good cultivation. Annexed is an engraving of the machine.

Funigating.—On this subject a pamphlet \* has just issued from the press, in which the benefits derivable from fumigating horticultural and agricultural crops is pointed out, and some of the machines invented for that purpose are represented and strongly recommended. The chief object appears to be to recommend vapours in preference to powder or solution, and we are told (p. 4) that vapour of tobacco smoke is "not only innoxious to the most delicate plants, but congenial to their growth, while it effectually cleanses and invigorates them, and destroys the Aphides and Thrip." The italies are our own, and we have no doubt but these parts of the quotation will be quite new to our practical brethren. We, in our simplicity, when we have seen stages and shelves strewn with fallen flowers the day after fumigating, have blamed the filthy weed, and thought it injurious, and we must still confess we are not likely to apply to fumigation for an "invigorating" and "congenial" atmosphere. For fumigation on a large scale, and for agricultural crops, machines of a large size are manufactured, and the material recommended (p. 7)" is damaged hay, straw, or refuse herbage in a damp state, mixed with coal tar or sulphur." Truly this is a queer mixture, better suited for destroying insect life in the neighbourhood of St. Giles' and Seven Dials, and other parts of the great metropolis, than for removing the "ills" which the crops of our protectionist friends "are heir to." "It is not pretended that blight or aphis can be totally destroyed in the open air by means of smoke, still the insect will be so paralysed as to render it unable to prey upon the young crops, and if the plants can be grown into rough leaf it is beyond the danger of its ravages." Fumes of sulphur and coal tar against vegetable life!! O tempora, O mores; and this in the nineteenth century, the great 1851!! The work has evidently been "got up" by some ignorant pretender, more interested in selling fumigators than destroying insects. for certainly no person acquainted with the subject could have strung together such a tissue of misrepresentation, and the sooner the pamphlet is involved in its own smoke the better. We are sorry to see the name of the "Gardeners' Chronicle" even as the publishing office connected wth it.

#### THE HORTICULTURAL SOCIETY.

May 1.—This was the anniversary meeting for the auditing of accounts, electing of officers, &c. Two new propositions were submitted for the consideration of the Council, one to admit, under certain regulations, Fellows and their friends to the Garden on Sunday afternoons, and the other for an unlimited number of privileged tickets, for the exhibitions at the Gardens, to be issued to Fellows up to a certain day prior to the first exhibition. The first proposition we hope to see carried out, for we see

• Bradbury & Evans, London.

no reason why the beauties of nature should not be as much admired on Sundays, as upon any other day. Several new members of Council were elected, and Dr. Royle, as Secretary, in the place of Dr. Daniels.

May 20.—As is usual during the exhibition months, this meeting was thin both of subjects and visitors, indeed the whole of the plants were from the Garden of the Society. Among them, however, were several things of interest, more especially Brownia Ariza, a new species of Hartweg's, introduced from South America; a noble-looking stove shrub, producing one large pendent bunch of splendid scarlet flowers, not unlike, but very much superior to, Astrapæa Wallichii; the foliage is pinnate and very large, and the plant promises to become one of our noblest stove plants, and little inferior to Amherstia nobilis. An Epidendrum, also introduced by the same collector, was there; but it had pale greenish-white flowers, not of much interest. An old, but very beautiful plant, Bauera rubioides, was also sent from the Garden of the Society, and also an interesting little thing, Anadenia pulchella. Ceanothus papillosus, and dentatus, were exhibited in good condition, with Erica Cavendishiana, Indigofera decora, Rhododendron formosum, and several other things. From John Luseombe, Esq., of Coombe Royal, Devonshire, were cut flowers of Rhododendron, from the open garden, and in considerable variety. A dish of good Royal George Peaches was sent by Mr. Raith, Gardener to Mrs. Smith; and Mr. Davis, of Oak Hill, Barnet, forwarded a noble basket of Black Hamburgh Grapes, in splendid condition, and a tolerable Providence Pine.

## THE NATIONAL FLORICULTURAL SOCIETY.

May 8.—A number of plants and cut flowers were sent, but only a few of much interest. Messrs. Henderson, and Mr. E. G. Henderson had collections of Cinerarias, among which might be seen most of the leading kinds. A single flower of an Azalea, of considerable promise, came from Mr. Catiel, of Liverpool, and cut specimens of Calceolarias, from Messrs. Schofield, of Leeds; Pansies, from Messrs. Youell, of Great Yarmouth; and Cinerarias, from Messrs. Widnall and Ivery & Co., of Dorking. Messrs. Henderson sent a Pelargonium, called White Unique, which proves to be an old acquaintance of some thirty years' standing, known in the North of England as Princess Augusta. However, it is a good thing, and we are glad to see it again. Mr. Ivery sent Lilac Unique, a distinct and useful bedding kind; and Mr. Ayres had some seedling Fancy Pelargoniums—Gipsey Queen, and a very high-coloured one, called Brilliant. From Mr. Epps, of Maidstone, came Erica tricolor Eppsii, a showy, early kind; and Mr. Reed, gardener to W. A. Coombe, Esq., had a striped white Azalea, called Pictura. Mr. Jeyes, of Northampton, contributed a number of Cinerarias, not of much interest, and he had also two Azaleas. Pansies came from Mr. Turner, and Mr. Bragg; and Mr. Willison, of Whitby, had some Epiphyllums, much injured by trayelling.

May 22.—At this meeting Messrs. Henderson and Mr. E. G. Henderson contributed a quantity of plants for decoration, and the latter gentleman had several promising seedling Cinerarias, to one of which, Rosalina, a white flower with gray disc tipped and shaded with ultramarine blue. a certificate was awarded; and another lilac purple flower, called Nonsuch, was commended, Mr. Ambrose, of Battersea, sent a very showy Cineraria, named Formosa, which was commended as an excellent market plant. The same gentleman sent a number of seedling Fancy Pelargoniums, but they were not in good condition; to one called Attraction a ticket of commendation was given. Mr. Hoyle, of Reading, produced his seedling Pelargoniums—Magnet, Chieftain, and Herald; the latter is a distinct finely formed flower, but the others were sadly out of condition. Mr. Dobson produced Commissioner, Gem, Ambassador, and Incomparable, the latter of which was commended for its brilliant colours. A Pelargonium, supposed to be from Mr. Turner, of Slough, marked Foster's, No. 15-1850, is a flower of great substance and exquisite form, but, not being entered, no notice could be taken of it. Seedling Pelargoniums came also from Mr. Bragg, the Rev. M. Trimmer, and Thos. White, Esq., of Braintree, but they do not call for special remark. Mr. Gaines had some promising seedling Calceolarias, two of which, numbered one and four, were commended. Messrs. Henderson also sent some seedlings, but they were very coarse. Mr. E. G. Henderson sent some Gloxinias, among which Von Humboldt and rubra violacea were the best, and Rhododendron—aureum superbum came from the same establishment. From Messrs. Henderson we noticed Erica-vestita, carnea, tenuifolia, a profusely blooming and very neat kind, and Azalea—Duke of Devonshire, and Scarlet Pelargonium-Commander in Chief, with two fancy kinds, Albonii and Princess Maria Galitzen, which are nearly identical. Mimuluses were sent by Mr. Wyness; Tulips by Mr. Willison—some breeders of considerable promise; and Pansies by Messrs. Bragg, Turner, Chater and Son, and Hunt. Mr. Ambrose had a mule plant between Rhododendron and Azalea, with pretty rosy pink flowers.

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#### ACACIA GRANDIS.

Nat. Order .- LEGUMINOSÆ & MIMOSEÆ.

Generic Character.—Acacia, Necker.—Flowers polygamous, perfect and staminate. Calyx turbinate, urceolate or bell-shaped, four or five toothed. Corolla hypogynous, funnel-shaped or turbinate or tubular, bell-shaped; limb four or five toothed, the lobes equal, valvate in astivation. Stamens ten or more, inserted on the base of the corolla or the stalk of the ovary, exserted; filaments hair-like, free or monadelphous at the very base; anthers two-celled, bursting longitudinally. Ovary sessile or stalked; style thread-like; stigma simple or funnel-shaped, capitate. Pod continuous, dry, two-valved. Seeds numerous, ovate-oblong. Embryo exalbuminous.—Trees or more rarely shrubs, unarmed, or very frequently spiny with thorn-like stipules, growing in tropical and sub-tropical regions all over the world, most abundantly in New Holland; leaves

alternate, twice equally-pinnate, or with the leaflets abortive and the petiole dilated into a phyllode resembling a simple leaf; flowers densely spiked or capitate, white, rosy or very frequently yellow.—(Endlicher Gen. Plant., 6834.)

Series 3. Pulcheller.—Unarmed or with axillary spines; leaves bipinnate; capitules or spines axillary; peduncles solitary from each bud, often several in one axil.

Acacia Grandis.—Grand Acacia.—Shoots hirsute with spreading hairs; leaves of two pinne, each bearing eight to ten pairs of leaflets; peduncles one or two in an axil, about an inch long, bearing yellow globular heads of flowers.

SYN.-A. grandis, Hort.

ESCRIPTION.—A shrub of a moderate size, flowering freely while small. Stems angular, a little zig-zagged, grooved, hirsute with long spreading dusky white hairs. Leaves alternate, with two pinnæ, and an intermediate short thread-like prolongation of the petiole, terminating in a little globular head; stipules between spiny and bristle-like, brown, one on each side of the base of the leaf and a third between the bases of the pinnæ, beneath the prolonged petiole. Pinnæ about one inch long, bearing on each side eight to ten linear-oblong obtuse alternate leaflets, with oblique bases, the rachis flattened, hirsute, and terminating in a small foliaceous point; leaflets glabrous, pale green. In the axils of the leaves are found, first, a minute gland-like body, which is apparently an abortive inflorescence bud; either one or two small cup-like involucres, out of which arise flower-stalks; and, finally, an articulated woody spine nearly half an inch long. The peduncles are about three quarters to one inch long, glabrous, and bearing globular heads of yellow flowers. Flowers very numerous; ealyx funnel-shaped, tubular, five-toothed; petals five, equal, yellow; stamens yellow, indefinite.—A. H.

History, &c.—A very showy greenhouse shrub, native, we presume, of New Holland. We have, however, no information as to its introduction. Our figure was made in the nursery of Messrs. Henderson, Pine Apple Place, in the spring of the present year; and small plants were exhibited, by Mr. Henderson of St. John's Wood, at one of the exhibitions of the Royal Botanic Society, in 1850. Its large and profuse golden capitules make it one of the most strikingly handsome of this showy family.—M.

Culture.—Among the gay plants of winter and spring, this tribe of New Holland shrubs is entitled to take a high rank, for though the flowers may be much alike in colour, they differ very considerably in form and character, while the plants are not only diversified, but some of them are remarkably elegant in foliage. The soft pinnate foliage, and golden plumes of A. pubescens, is very elegant; while the noble foliage of A. lophantha, as seen upon a young vigorous plant, is exquisitely beautiful. Akin to the former of these in point of neat appearance is A. grandis, a plant which is likely to become of general interest, and is found to be of easy culture. The Acacia is propagated by cuttings of the half-ripened wood, and also by seed, which some of them produce in great abundance. The stronger growing kinds grow well in pure loam, but some of the weaker rooting species like a little leaf mould or peat, added to it, and also some gritty sand. Such a soil is suitable for the kind under notice, A. grandis; and in it, it will grow with great luxuriance. During the growing season the plants should be kept in a moist growing atmosphere, but when the growth is nearly completed, care must be taken to ripen the wood by full exposure to the sun and air. This species flowers rather late in the season, and hence may prove useful for the May exhibitions, when its colour will be found useful. Should the plants grow wildly, they must be curbed a little by timely stopping, so as to make them assume a neat and compact form. Liquid manure will be found useful for the plants when the pots are full of roots; and when once established, it is surprising how long such plants keep in health and bloom in comparatively small pots. Indeed we have known plants stand for ten years in the same pots without shifting, and yet bloom annually in first rate style.—A. YOL, HI.

## Regetable Physiology.

BY ARTHUR HENFREY, Esq., F.L.S., LECTURER ON BOTANY AT St. GEORGE'S HOSPITAL.
CIRCULATION OF FLUIDS.

TITE last considered (p. 153) merely the circumstances connected with the absorption of fluid nourishment by the superficial cells of plants—those lying immediately in contact with the external supply. In the lower tribes of cellular plants, consisting simply of strings of cells or expanded plates of cellular tissue, all the cells are directly in relation to their external supply, and in most cases the individual cells seem to absorb and assimilate their food independently, as in the Confervace and other simple Alga. But as vegetables become more complex in their structure, some cells or collections of cells becoming devoted to the execution of one physiological function, others to another, it is evident that an interchange of the cell-contents must be required. Thus in the Lichens even, the plants present layers of cells of different characters, some appearing to be more particularly destined to the function of elaborating the crude nourishment, and as these furnish the supply to the rest, distribution of a simple kind undoubtedly exists here. We have no positive ideas respecting the laws which regulate this distribution; all we know is, that it does take place, as may be proved by causing chemical solutions to be absorbed by particular parts of the cellular expansion composing the plant, and demonstrating their penetration into the other parts by the action of re-agents upon them. Such a distribution may be proved to take place in the Mosses also, for when the roots of these are placed in a solution of prussiate of potash, the presence of this salt can subsequently be detected in the leaves, and even the capsules, by the action of the test upon them, namely, sulphate of iron, which colours the fluid contents of the cells there.

The distribution of the fluids absorbed by the roots becomes a still more difficult question when we come to examine it in the higher plants. With regard to the Monocotyledons, our knowledge of the facts even, is at present very imperfect; in certain cases of bulbous plants, which have been investigated by the action of chemical tests in the manner just described, the solutions absorbed by the roots appeared to rise chiefly in the cellular portion of the fibro-vascular bundles of the bulbs and flower-stalks, passing upwards to be generally distributed throughout all the organs. In regard to the Dicotyledons we are possessed of many more facts, and these indicate that there exists there a series of phenomena much more complicated in their nature, and regulated by some laws which are at present involved in the greatest obscurity.

It has been demonstrated by experiment, that the fluids absorbed by the superficial cells of the rootlets of Dicotyledons do not pass upwards in the rind of the roots, but make their way into the woody structure, even in the very small subdivisions of the roots, and through this woody structure pass upwards into the stem and branches. This is proved by two facts. If we remove a ring of bark down to the wood, from a growing tree, the course of the sap upwards is not interrupted; but if we carefully cut through the wood of a similar tree, taking care to injure the bark as little as possible, all that portion of the tree above the wound soon dries up.

From the wood of the stem the sap passes into the leaves, and here becomes spread through the soft cellular tissue, as is shown by the great evaporation of watery vapour from this substance. Before the sap has entered the leaves it is useless as nutrient matter, for the growth of a plant is arrested when we strip it of its leaves; the fluid rising from the roots up into the leaves is therefore called the crude sap. In the leaves this undergoes a chemical alteration, which renders it capable of being applied to the nutrition of the growing tissues, and then it passes back from the leaves and descends to the lower parts of the plant through the bark. This is proved by the fact that the removal of a ring of bark arrests the growth of the parts situated below it, while the growth of the portion above the wound is accelerated by the accumulation of assimilated sap in it, its woody layers become thicker, it produces more fruit, and this ripens sooner. In an uninjured tree a portion of the descending sap, unused for the development of new tissues, often returns into the wood, as is shown by the formation of starch in the horizontal medullary rings in autumn. Thus a kind of circuit is completed, not indeed in particular vessels, as in animals, but in a particular course through the different parts of the plant. Some doubt has been thrown on the existence of this circulation by recent writers, but the facts seem to admit of no other interpretation. The objections to the terms, ascending and descending sap, founded on the conditions exhibited by horizontal and pendent branches, are of no real value, since the main point of the question is not the absolute direction of the course in reference to the position of the plant upon the earth's surface, but the fact of the crude sap passing from the root to the leaves through the wood, and the assimilated sap

from the leaves backward through the bark, be the currents either upward, downward, or in a horizontal direction.

The upward current of the sap passes through all the woody mass of young trees, but as their age increases the old wood becomes solidified, and loses the power of conveying fluids, so that the current passes through the outer and younger layers. The more solid the character of the wood of a tree the sooner it loses its active functions, and thus an Oak tree will soon dry up and die if a ring of its young wood be removed; while in a tree with soft wood, like the Birch, for example, the inner portions of the wood convey sap even in very thick stems. The old wood which has become choked by the solidification of its cells, is known by the name of the heart-wood, or duramen, in contradistinction to the alburnum, or sap-wood.

Such being the general facts of the process, we now have to examine into its details, namely, as to which of the elementary organs the sap rises through, and by what force it is caused to ascend; and here we come to an inquiry full of obscurities, and rendered still more difficult by the numerous speculations that have arisen from the labours of those who have investigated it. Two most opposite opinions are mentioned in reference to the first of the above questions. While some authors contend that the sap rises in the vessels or ducts, others assert that these transmit only air, and that the sap flows through the cellular tissue. The strongest argument for the view that the vessels carry sap is furnished by the fact observed by several experimenters, that when plants have been made to absorb prussiate of potash, sulphate of iron has subsequently shown the presence of this in the vessels; but recent researches in the same direction, and in which the same experiments have been made, have yielded exactly opposite results, --without, however, furnishing any satisfactory clue to the contradiction; it is possible that the solutions may have passed into the vessels, in the first instances, through some accidental injury to the plant. The opinion that the vessels carry air is founded upon microscopic examination, which always shows air to be contained in them, excepting only under peculiar and temporary circumstances. In the winter a portion of the cells of the wood are filled with sap, and the vessels contain air. As the season advances the sap becomes more abundant in the cells, and makes its way also into the vessels, so that if the wood is wounded in the spring, the sap flows freely out from the cut ends of the vessels, while it is not effused if it be contained in the cells alone; after a time, when the unfolding of the leaves and the consequent great evaporation have removed much of the sap from the wood, the vessels are again found full of air.

It would appear, from the observations of certain travellers, that this fulness of sap is constant in some climbing tropical plants, the vessels being always filled with it. When the sap is contained in the vessels, it appears to be subjected to a more or less considerable pressure, being forced out with a certain force when the wood is wounded, as was shown by the experiments of Hales upon the Vine; yet, that this is not always the case would seem to be proved by the experiments of Gaudichaud and Poiteau on the tropical climbers before mentioned; in them the sap did not flow from either the upper or lower portion when a stem was simply cut across, but when a piece was taken completely out, by two cuts, the sap ran from whichever end was held downwards.

With these exceptions, however, the vessels may be safely held to contain air. In the Vine and other woody plants during the bleeding season the cells are filled with sap, and the vessels do not receive it until subsequently; after the unfolding of the leaves, when the evaporation has become active, the vessels again become emptied of sap. It may be concluded, therefore, that the cellular system of the wood is the tissue primarily and especially devoted to the function of conveying the sap, and that the vessels and duets take part in it only under certain circumstances, temporarily in most plants, when the stem is overfilled with sap; perhaps throughout the whole period of active vegetation in a certain number of plants possessing extraordinary abundance of sap.

## ON THE CULTURE OF ASPARAGUS.

By Mr. J. TOWERS, Member of the Royal Agricultural and Horticultural Societies, &c.

QUESTION of considerable interest presents itself at this time, in consequence of communications that have been published, and opinions hazarded, respecting the proper treatment of Asparagus beds and rows during the season of cutting for the use of the table; that is, under ordinary circumstances, from about the first week of May to the 21st or 24th of June. Much difference of opinion prevails; and having myself been a propagator and grower of this plant for a long period, in three remote counties, and under varieties of soil, aspect, and temperament—having, moreover, raised the plants from seed, experimented to a considerable extent, and attended to plots raised at periods

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more or less remote by others—I feel fully justified in urging the enquiry now to be made upon the strictest attention of all those skilful gardeners, public and private, who may peruse this article, and find themselves in a position to hazard a strong opinion.

The question at issue is, Whether, during "the season," every shoot, be its size what it may—in a word, every developement above the surface, great or small—should be cut and removed, so as to leave the bed entirely a blank; or whether the young advancing shoots, from crowns yet too feeble to produce "grass" fit for the table, ought to be retained in order to acquire strength? I am free to acknowledge, that, on physiological grounds, I squared my practice according to the theory comprised in the second portion of the question. Having perused the notices which have recently appeared in print, and made inquiries of able practical growers, without obtaining a satisfactory conclusion, I resolved to address one whom I deemed to be a thoroughly competent authority, and whose judgment could hardly admit of being impugned. The following lines contain the substance of the communication with which I have been favoured:—

"The market-gardeners, and the best of those employed by gentlemen, make it their constant practice to cut off every shoot, not permitting one head, however small it may be, to grow, until the close of the 'cutting season;' taking particular care, however, in ordinary cases, not to let that extend beyond five or six weeks, though there may be exceptions, dependent upon the weather, when a week or two more may be allowed. The practice by which plantations are seriously injured, rendered patchy, and even destroyed, is not that which is described above; but consists in tasking the vital power of the Asparagus-crowns, by a too rigid cutting, continued after the turn of days, and so long as a single eatable head comes up—a practice which some injudicious growers are too apt to indulge in."

The advice so restricted, and attentively observed, cannot be considered dangerous, provided only a few of the strongest heads in the *third year* from the seed, or rather not until the fourth year, be taken. In Berkshire, I found that my best beds, raised from home-produced seed, were scarcely, if at all, in arrear of others, *planted* in April; but upon *all* I found blanks, notwithstanding every small shoot was left entire for several successive years.

Pending the late enquiry, I consulted a market-gardener in Surrey, and was by him assured that several large beds had been seriously damaged by cutting the smaller heads, as above recommended. I therefore sought further authority; and by a letter now before me, am enabled to offer a statement

worthy the attention of our physiological readers:-

"Formerly it was the practice to leave all the small heads growing: the consequence was, that the numerous heads so produced were not half the size of those now grown; and the reason was this,—the great number of small shoots left ran away with much of the strength of the roots; the current of sap was with them; and instead of large heads possessing all the strength of the sap, others much diminished in size were yielded. Again, by leaving all the small spray, the bulk of the roots was increased, by which the crowns were, in a few years, made to produce fifty heads instead of twenty-five, and those of no better than second-rate Asparagus, whereas by taking off the small shoots, until the cutting season is over, the number of eyes is lessened, the buds of the following year are strengthened, and hardly any small stuff is produced."

Here, then, we find matter for enquiry, contemplation, and practical communication. Physiology instructs us that the roots consist of bundles of pale-coloured processes, each furnished with absorbent fibrils; the whole connected with a crown, where a number of buds are seated, from which stems are sent up. By leaving these crowns to strengthen during a course of three, four, or five years, we certainly (soils, manure, and tillage being adequately provided) insure strength and durability. The question to be considered is this: Will the total excision of every visible shoot during a few weeks of the spring incur the risk of obliterating a number of the really worthy and substantial crowns?

[We think the plan of taking every shoot throughout the "cutting season" utterly indefensible; and we rest this opinion on physiological grounds. It is not, however, a few of the weak shoots or small spray that should be left to grow, but one or two strong shoots, the weak ones being cut away. We do not object to cutting all the earlier shoots, say for the first fortnight or three weeks.]

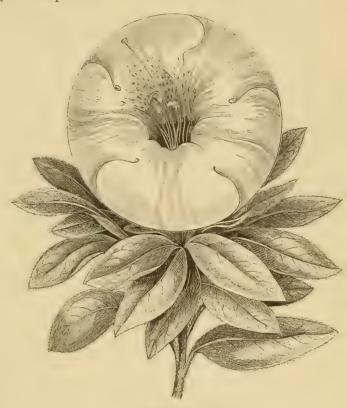
# THE POINTS WHICH CONSTITUTE PERFECTION IN THE INDIAN AZALEA.

BY MR. G. GLENNY, F.H.S.

NE of the most important qualities in all flowers is that which renders it lasting, for a lengthened period of bloom is every way desirable. The greatest improvement, therefore, that can be attained in a flower naturally flimsy is stout petals, and not only do thick petals last in perfection a consider-

able time longer, but they present a more dense body of colour or of white, as the case may be, while thin petals are naturally washy and transparent.

The Indian Azalea has but one petal, in five divisions, that is to say, it is what botanists call monopetalous with a five parted limb. In the old varieties the divisions are comparatively narrow and pointed, whereas they should be broad and obtuse, so as to form a complete circle by the indentations being concealed by the divided parts folding over each other, the edges being perfectly smooth. As colour is a matter of taste, there is only one condition that can enhance the value of a flower on that account, and that is novelty; but whatever be the colour it should be dense, as if the petal were made of coloured matter throughout, and not as if it were washed over with it. All variegations, whether spots or stripes, should be decided, well defined, well contrasted, and distinct, not shaded into one another. As the quantity of bloom is an object, the flower should be large, cupped a little, and abundant.



A PERFECT INDIAN AZALEA.

The foliage should be bright green, the plant short-jointed, the habit therefore close, whether a bush, a pyramid, or a standard tree; so that, when in flower, there will be a surface of flowers with the bright green obtruding occasionally to give effect.

As these plants are the most important of all at our Horticultural Exhibitions, it may as well be mentioned that to show them in perfection, they must not be shown with the new growth pushing out beyond the flowers. If it be essential to preserve the new growth, keep the plant at home, if you show it remove every shoot. It is the worst fault an Azalea can have, even if it be right in other respects, to have the new growth protruding beyond the flowers.

To sum up, therefore, according to *The Properties of Flowers*, the flowers should be round, thick, smooth, cupped, and abundant; colour dense, new, if we can get it. The habit close; branches short jointed; foliage bright green; surface covered with bloom, and no new growth on the plant.

## LITERARY NOTICES.

Hooker's Species Filicum (Pamplin).—This purports to be a description of all the Ferns known to the author, with figures of the more novel and least known kinds. The first volume was completed some two or three years since, and we had feared the work was discontinued, which we are now glad to see is not the case, the fifth part, or the first part of the second volume, having recently come to hand. Any book which, professing to bring together the scattered information on a particular subject, is produced with ordinary care, becomes useful; and we need therefore searcely say, that the work before us, must be, from Sir W. J. Hooker's extensive acquaintance with this charming race of plants, a valuable contribution to botanical science. We can say this heartily, while, at the same time, we may not take precisely the same view with the talented author, as to the limits of genera, or

the identity of species. It appears to us that Sir W. Hooker studies Ferns chiefly in his herbarium, which no doubt contains most valuable and extensive materials; but experience teaches us that many Ferns cannot be safely dealt with in the dried state, and that to understand them thoroughly fresh and perfectly-developed specimens should be examined. The study of imperfect specimens in natural history very often leads to the expression of artificial characters, extremely puzzling to the student; and if this is true generally, it is especially so in reference to that class of plants which forms the subject of these remarks. Nature in her own proper and complete condition—the living plant, that, wherever practicable, should be made the groundwork of scientific inquiry. In looking through the pages before us, we find some points in which we differ with the talented author, probably from the very fact to which we have just alluded. The genus Hypolepis is referred back to Pteridea, whence Mr. Smith had, with good reason, as appears to us, removed it. The species of Cheilanthes, having punctiform sori, and distinct, free, roundish indusia, are here united to Hypolepis, in which, according to our view, the sori are covered, not by an indusium, but by an indusiform crenule. Among others, Cheilanthes spectabilis of Kaulfuss is referred to Hypolepis, though it often possesses a continuous indusium, widely different from that assigned to an Hypolepis. The author rejects a reticulated venation as of itself affording a sufficient character for generic distinction, and thus at once quashes the genus Hewardia, and, as a consequence, some others; and, in support of this view, reference is made to Adiantum Wilsoni, a Jamaica species cultivated at Kew, in which, on the same fronds, a free venation and a partially anastomosing venation are present. This evidence would appear decisive; and the case is by no means solitary. We think, however, a distinction should be made between the case in which a few veinlets here and there in some fronds anastomose, and that in which the reticulation is uniform over the whole of the fronds of the entire plant; and hence, this latter being what occurs in Hewardia, we are not willing that the complimentary dedication of a genus to our friend Mr. Heward (to whom our own pages are under obligation) should in this case be set aside. The present part contains the descriptions of the whole of the beautiful and extensive genus Adiantum, the genus Lonchitis, and part of Hypolepis, and is illustrated by twenty plates, representing fifty-three species. No one interested in Ferns should fail to possess this Species Filicum as a text-book.

Hogg's British Pomology (Groombridge).—Mr. Hogg promises in this work, which is being issued in numbers, to give the history, description, and classification of the fruits and fruit-trees cultivated in the gardens and orchards of Great Britain, with synonymes, references to figures, and so forth. Judging from the two first numbers now before us, this appears to be done with care. The book, in fact, is to be a description of fruits—all known fruits, we presume; the most remarkable being accompanied by outline figures. We shall be glad to see it go on and prosper, for it will form a reference-book, useful to all the various classes interested in the subject of fruit-trees, as teaching them both what to purchase and what to avoid. This latter consideration alone could justify the descriptions of all the interminable varieties of some of our fruits, nine-tenths of which might with advantage be consigned to the faggot pile. If we were disposed to find fault with the author, it would be that he is on too friendly terms with quotations from the Latin and French; and not severe enough in his estimate of quality. We find upwards of sixty "first-rate" kinds, in an alphabetical enumeration of Apples, which as yet extends only as far as "Golden Pippin," besides a number of "excellent," as distinguished from "second-rate" sorts.

Paul's Cultivation of Roses in Pots (Piper).—Mr. Paul's fine pot Roses, which we hope many of our readers had an opportunity of seeing at the Metropolitan Exhibitions last May, were a better criticism on this second edition of his instructions how to grow them, than any remarks we can make. We therefore merely state, that several woodcuts, illustrative of pruning, are now given; and the author, as he tells us, has endeavoured to convert the hasty notes of the former edition into more solid matter.

Donald on Land Draining (Orr & Co). This is the title of a shilling volume recently issued, and forming one of the series of "Richardson's Rural Handbooks." It gives a very clear and comprehensive view of the principles and practice of this all-important operation, and may be advantageously consulted by all who are interested in the practical amelioration of the soil. We shall endeavour to quote from it hereafter; in the mean time, we gladly commend it not less for its valuable information than for its elegance and cheapness.

Victoria Regia (Reeve & Benham). We have here a series of four magnificent plates, representing the different stages of the flower, and a series of dissections, of the Royal Water Lily, admirably drawn by Mr. Fitch, and accompanied by full historical and descriptive text, from the pen of Sir W. J. Hooker. The drawings themselves occupy a space of about twenty-one inches by fifteen, and represent the entire reduced plant, and the flowers full sized in different stages, one plate being devoted

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to dissections. The experience of cultivators seems now to prove this noble aquatic to be at most biennial in its duration; and as it so rapidly reaches the flowering stage, the simplest mode of culture, will no doubt be found to be that of raising young plants in spring, and thus avoiding the trouble and anxiety of nursing them through the winter. We learn with satisfaction, from the pages before us, that "the Chief Commissioner of Woods and Forests has it in contemplation to erect a new house in the Royal Gardens, containing two tanks, upon a scale suited to the cultivation and full development of this truly regal plant."

Domestic Pigs (Orr & Co.)—Although not a botanical subject, we may stop to notice this useful work, which is the last edition of Richardson's Handbook upon the subject. It forms a neat and very cheap volume, and contains a history of the various breeds of porkers from their origin to the present time, pointing out the peculiarities of each, their diseases and remedies, down to fattening, slaughtering, and final curing of the same for pork or bacon. To those of our inexperienced friends who, after taking a wife, find it convenient to stock the family pot by keeping a pig, and to those ladies who are not au fait in the art and mystery of salting pork or curing bacon, the little brochure before us, as containing the experience of a person of large practice in various parts of the country, will be found exceedingly useful; and having profited by it ourselves, we can confidently recommend it to our readers.

## REMINISCENCES OF RHODODENDRON CULTURE.

BY AN AMATEUR, OF LEICESTER.

IT is with much pleasure that I see the beautiful figure of Mr. Cunningham's fine Hybrid Rhododendron at p. 121. I am particularly fond of the beautiful Rose-bay tribe, and as the way I deal with them may, perhaps, interest some of your readers who reside in localities where the soil, as here, is unfavourable for their cultivation, I will give a short account of my mode of proceeding.

Convinced that a very general cause of disappointment to amateurs is the attempting more than they have suitable convenience for, I have restricted my collection, with a few exceptions, to the Camellia, Rhododendron, and Indian Azalea. These three genera possess the strong recommendations of being more than usually showy both in flower and foliage, of blooming early, and of being free from insects. They begin to flower with me about Christmas, and continue to increase in beauty till the month of May, when the garden out of doors presents another succession. There is no soil in this neighbourhood suitable for the cultivation of American plants. It has to be brought at a considerable expense from a considerable distance, consequently I am obliged to be economical in the use of it. I grow none but the finest varieties, and mix one-half sandy loam with the peat which I procure. I speak now of the Rhododendron and Azalea; the Camellia I do not use any peat for. As the young Rhododendrons grow, they are shifted from pots to tubs, the largest requiring four men to move them, till being too large to be retained longer within doors, they are planted out in the open ground, where they soon become larger still.

The greenhouse is of the most ordinary materials and construction, being in great part made up from old houses removed from a former situation. It is not quite 200 feet long, and little more than 10 feet wide, forming a long and narrow slip. It is heated when necessary by a common smoke flue, which is continued from one end to the other, and the top of which forms the walk. On one side of the walk, a lattice work, about two feet broad, and raised about two feet from the ground, runs along the whole front; on the other there is a space, level with the walk, of five or six feet, on which the larger plants are placed. I do not mention the form of the house as having anything particularly to recommend it, beyond the effect produced by the long vista which it offers; it was adopted as being best suited to the position which it occupies. When filled at Christmas, the effect of the dense and shining foliage, so clean-looking, bright and healthy, of the Camellias and Rhododendrons, is as cheering as anything at that dull season well can be, and though no fire is used except to keep down damp, or to keep out severe frost, the Camellias soon begin to open their blossoms, followed by the Rhododendrons, which require all the severity of an external exposure to keep back their vigorous vegetation. Next come the Indian Azaleas, presenting an endless gradation of the richest and most varied colours, of every hue but blue and yellow; the latter being confined to A. sinensis. The Belgie and other hardy Azaleas, I grow only in the open ground, and they are now (May), with the Rhododendrons, coming out in great beauty.

It will be obvious to every one, that in order thoroughly to enjoy a conservatory or greenhouse, a reserve or succession is necessary. None but flowering or attractive plants should appear there, and whatever is sickly or unsightly should be removed. Now, to accomplish this requires an extent of

accommodation for tender plants which none but wealthy cultivators are equal to. But both the Camellia and the Rhododendron are so hardy, and will do for a time with so little light, that any spare shed or out-house may be made to serve as a temporary protection for them, and it is by this means that as fast as my Rhododendrons go out of flower, I am able to supply their place by fresh ones. A beautiful white Rhododendron (caucasicum superbum) raised by the same cultivator as the one figured at p. 121, flowered with me in February, having more than seventy noble trusses of bloom. Immediately after flowering, it was removed under a shed, exposed to the open air, and is only now making its shoots. When grown too large to be longer manageable, they are turned out as I have said, into the open ground, where their size and age gives them a good chance of not suffering much from the exposure; but in order to protect the blossoms from being injured by severe weather, moveable screens of straw are placed over them as soon as sharp frost sets in, which are not removed till March is over. They are now in fine flower: those in the greenhouse being over, and removed out of doors in their tubs. The Camellias and Azalea indica are kept in-doors till the wood is ripened, and then all are put out for a short refreshment in the open air, till the chill nights and heavy rains of autumn require them to be again placed under shelter.

In addition to the other recommendations of these beautiful tribes, they are easily and safely propagated by laying down or inarching, so that specimens of various ages may always be provided without difficulty. Persevering and successful efforts have lately been made to increase the hardihood of the hybrids continually coming into bloom, but after all it may be doubted whether any plant exposed to the rough and variable weather of our inconstant springs, will often expand its blossoms in

the perfection it displays when sheltered from all ungenial influences.

Rhododendron caucasicum grandiflorum purpureum which I had from Mr. H. Waterer, and which is a late flowerer, is now loaded with trusses of bloom twenty-four inches (nearly three quarters of a yard) in circumference, and eighteen inches over, the single blossoms being four inches across. The other varieties flower with equal luxuriance.

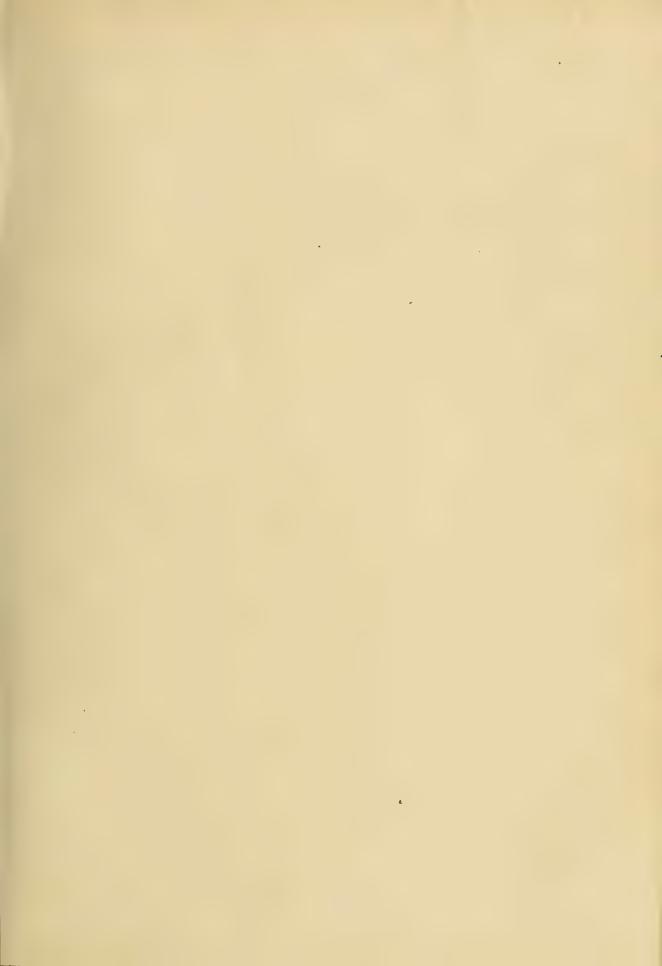
## BOTANICAL FRAGMENTS.

The leading considerations with the hybridist in the selection of parents, according to Mr. Cole's experience, should be: 1, Family alliance; 2, Constitutional affinity—that is, choosing two plants with organic similarity of growth, whether bulbous, herbaceous, ligneous, annual, or otherwise. Where such distinctive differences exist, though the family alliance is undoubted, no cross has hitherto been produced; as, for example, between Tropæolum brachyceras, and T. aduncum, two plants which exactly accord except in one minor point; one being tuberous-rooted, the other annual.—(Midland Gard. Mag.)

Under the name of Campanula coronata there was shown last year at the exhibition of the Societé Royale de Flore, at Brussels, a beautiful hardy Campanula, distinguished by breadth of flower, and by a large coloured calyx arranged in the form of a star. The name coronata has been given to it on account of this form of the calyx. The plant in question belonged to M. Symon Brunelle, who sent to Professor Morren a flower for examination; but he had previously received a branch from M. Putseys, the Vice-President of the Society, who introduced it to Brussels from the gardens of Arras (in the north of France). There can be no doubt it is a variety of C. persicæfolia of Linnæus; but in the seven varieties of this species noticed by De Candolle, the plant under consideration is not Reichenbach, in his Centuries of Icones has described and figured a Campanula persirecognised. cæfolia calycina, having large, distinct, oval-lanceolate calyx lobes, and the corolla narrow at the base; but in the variety coronata, the calyx is one piece, the lobes being joined half their length at the least, and presenting the form and the colour of a second corolla. The calyx also is white, but the points of the lobes are tinged with green. Dr. Morren has characterised it as follows:—Campanula persicæfolia coronata: calyx monophyllous, very broad, stellated, lobes joined as far as the middle, free at the summit, angular, one-colored; corolla simple, campanulate. This species is often found double. In the variety under notice, the corolla is simple, the only modification is in the calyx. It is a showy perennial.—(La Belg. Hort.)

Sir W. J. Hooker refers our Franciscea confertiflora to Mr. Bentham's Brunsfelsia calycina. With the F. confertiflora (Brunsfelsia confertiflora, Bentham) Sir W. Hooker is familiar, and a splendid figure of it occurs in Pohl's Plantarum Brasiliarum Icones; but Pohl's description and figure are said to be quite at variance with our plant, which is unquestionably the F. (Brunsfelsia) calycina, figured characteristically enough in the Flora Fluminensis, and well distinguished by its large inflated calyx. If this be so, the name F. calycina will require to be substituted for F. confertiflora, at p. 73 of our

present volume.





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#### TRICHOPILIA MARGINATA.

Nat. Order. - ORCHIDACELE.

Generic Character. — Trichopilia, Lindley. — Sepals and petals of the spreading perianth equal, linear, crisped. Label-lum large, convoluted, parallel to the column, three-lobed, the intermediate one somewhat two-lobed, flattish, naked inside. Column round, club-shaped, the clinandrium hooded, three-lobed, villous-fringed. Anther one-celled, compressed, convex in front. Pollen-masses two, furrowed at the back, adherent to slender wedge-shaped caudicles: gland very small.—Mexican herbs, with fleshy pseudo-bulbs, clothed with spotted scales, one-leaved; leaves leathery, flat or slightly folded; flowers axillary, solitary.—(Endlicher Gen. Plant., 1451.)

TRICHOPILIA MARGINATA, nov. sp.—Bordered-lipped Trichopilia,—Pseudo-bulbs long and narrow, compressed, bearing one folded leathery leaf at the summit, clothed with brown scales at the base; scapes arising in the axils of basilar scales, short, thick, and fleshy, clothed with several small fleshy imbricated scales at the base, decurved, one-flowered; flowers large; sepals and petals pale greenish, with purple shading above; labellum large, deep purplish-crimson or plum-coloured in the middle, shading off into a white margin.

Syn .- Trichopilia coccinea, of gardens.

ESCRIPTION.—A pseudo-bulbous herb; the pseudo-bulbs occurring in groups, fleshy, long, narrow, and compressed, bearing one leaf at the summit, which is folded below and channelled to the summit; the base of the pseudo-bulbs clothed with a few rather large brown scales, closely applied. The scapes, arising from the axils of scales at the base of the pseudo-bulbs, are short, thick, and fleshy, and clothed with several small fleshy imbricated scales at the base. The flowers large, spreading, and solitary, with the sepals and petals alike, narrowly linear-lanceolate, acuminated, crisped, with a thickened midrib, pale green, with purplish shading, chiefly on the upper side, leaving a light margin. Labellum very large, narrowed into a long claw, parallel to and adherent nearly half way up the column, the margins of the expanded portion rolled over the column, so as to produce a funnel-like aspect in the labellum, the mouth of the funnel being recurved. The limb, when opened out, obscurely three-lobed, the middle lobe squarish, emarginate; the central part of the limb deep purplish rose or plum-coloured, shaded off, and with veins radiating into the broad white recurved margin. Column continuous with the ovary, terete, club-shaped, with a fringed membranous hood.—A. H.

History, &c.—This very pretty species was recently introduced into this country by Mr. Linden, from the interior of New Grenada, in the western hemisphere, and has already flowered in several collections. We believe J. H. Schröder, Esq., of Stratford, was the first to bloom it; and our plate is prepared from a drawing we were kindly permitted to make from Mr. Schröder's plant, after the Royal Botanic Society's May Show, at which, as well as at the Chiswick fete, one or two flowering plants were produced.

Culture.—This plant is found on trees in the higher parts of New Grenada, and therefore it may be concluded that it does not require the heat of the Indian orchid-house. It thrives best in a pot, in a compost of peat, leaf mould, chopped sphagnum, broken potsherds and charcoal, mixed in equal proportions, and used in as rough a state as possible. An important point is drainage: every pot should have at least half of its depth filled with broken potsherds; these should be in three sizes, the largest at the bottom, the middle sized upon them, and then a covering about half an inch thick of the smallest size. Upon the whole place a thin covering of In proceeding to pot the plant, divest it of any old compost which may hang about it, clear the leaves, and the surface of the pseudo-bulbs, of any intruders of the insect tribe which may infest them, and wash the leaves quite clean; then fill up the pot to the level of the rim with the compost, set the plant in the centre, fill up all round with compost, and by means of some hooked pegs fix the plant firmly; give a good watering, and the potting is completed. The proper time for potting is as soon as the young growths have got to the length of from one to two inches. The season of growth should commence with us about March, and be carried slowly on till September. The season of rest should be the remainder of the year. The temperature to which the growing plants should be subjected is about 65° by day, and 60° by night; when the plant is at rest, 55° by day, and 50° by night, will be hot enough.

The progagation of this, as of other pseudo-bulbous Orchidaceae, is effected by careful division of the plants.—A.

# THE CHEMISTRY OF SOILS AND MANURES.

By Dr. A. VOELCKER, Professor of Chemistry in the Royal Agricultural College, Cirencester.

ON THE FORMATION OF SOILS-CHEMICAL CAUSES.

OTWITHSTANDING a general similarity in the composition of arable soils, the character and AI appearance of many soils in every country present striking differences, which cannot fail to attract the attention of even a superficial observer. The forms and proportions in which the chemical elements usually constituting soils are mixed together, in different localities, explain in some measure, though by no means fully, the various appearances and agricultural capabilities which they possess. These forms and proportions themselves depend on the causes and circumstances under which they originated. We must therefore consider the mode of formation of soils as a third or primary cause of their diversity.

Hence arise the following questions—How are soils formed in general? Has there been one cause at work, or have several conduced in producing different soils? What relation does the surface soil bear to the subsoil? Does the surface soil always present the same relation to the subsoil or rock on which it rests? or, in other words, Does an invariable law connect the surface and substrata?

These are questions, a correct answer to which will enable us not only better to distinguish soils from each other, and to classify them according to their more prominent characteristics, but which will also indicate whether a soil possesses in itself the means of improvement, and suggest the means by which it may probably be permanently improved at the least cost. We shall therefore endeavour

to give a brief sketch of the origin and formation of soils.

The manner in which some soils are formed will not be long doubted by any one who has observed the appearance of large rocky masses, the clefts and crevices they present, the bare surface of their smoother and harder parts; the growth of mosses and smaller plants on the more softened portions; the accumulations of gravel, smaller fragments of minerals, and fine mud, with their luxuriant vegetation at the foot of these rocks and in the valleys of mountainous districts. He will not hesitate to trace the origin of these soils to the degradation and decomposition of the solid rocks in their immediate neighbourhood, especially to those which occupy the surrounding eminences. But rocks differ much in composition. A sandstone, it is evident, in the course of time will produce a soil totally different in appearance and character from that formed by the disintegration of an oölitic or slate rock. The first will produce a light, porous sandy or gravelly soil; a slate rock, on the contrary, a stiff, more or less cold, impervious soil. From the crumbling of a limestone a calcareous soil is formed; from a trap, a good, rich, fertile, generally reddish loam. Basalt rocks, which are found over a great part of Scotland, and here and there in England,—for instance, in some few places in Cornwall, Gloucester, Devon, Cumberland, Hereford, &c., and in abundance in the North of Ireland,—give rise to friable reddish, brownish, or greyish coloured, very fertile soils. In Dorsetshire, Wiltshire, Berkshire, a portion of Norfolk and Suffolk, many soils resting on the chalk formation are made up of decomposed chalk, with or without flints, and partake generally of a dry, loose, friable character. Thus a geological map of Britain, in which the districts which are covered by rocks of different kinds and ages are indicated by different shades of colour, may convey to the farmer a knowledge of the general nature, agricultural capabilities, and limits of the soils, which rest on, or may generally be inferred to be formed directly from the crumbling down of, their respective geological formations. The study of the rocks of a country is therefore of interest to the cultivator of the soil, as it will enable him to predict in a general way the character of the soil of a district in which certain rocks prevail. Though useful to the gardener, this study must benefit the farmer in a greater degree, because the gardener, particularly the flower-gardener, seldom has to deal with extensive districts, and because he has it more in his power to render himself independent of the natural resources, and operating on a small scale, may resort to additions and mixing of soils which the former seldom can practise. For this reason it is unnecessary to enter into a minute description of the soils which are formed in this country by the disintegration and decomposition of the several geological formations, and we proceed, therefore, to inquire how it is that the solid rock gradually crumbles down to powder, and gives rise to a more or less fertile soil. In some instances we can trace the changes rocks undergo in the course of time, step by step, and refer them to their true causes; in others only the ultimate products of decomposition are well described, and their primary causes less clearly understood. This much is quite sure, that the causes which produce these mighty changes are various and often complicated. Some of them may be referred to chemical forces and agencies—we will call them "chemical causes;" others, which are based on purely mechanical principles, we shall distinguish as "mechanical

#### THE CHEMISTRY OF SOILS AND MANURES.

causes." A few agencies in producing these changes partake of the nature of both; they act partly chemically, partly mechanically.

I. Chemical causes of the degradation and disintegration of rocks.

1. One of the principal chemical agencies in effecting a gradual disintegration of solid rocks is the atmospheric oxygen. For many mineral elements oxygen possesses a most powerful affinity, and consequently a strong tendency of forming new compounds. These compounds as oxides, being always more voluminous, looser and less compact, are the primary cause of the bursting of many rocks, particularly of those containing much iron. In the course of the formation of these oxides, the compact texture of the rock is broken up, and the whole mass of the rock gradually crumbles down. In basalt rocks this process of disintegration can be well observed. Those sides of such rocks which are most exposed to the atmospheric influences will invariably be found on the surface softer and less compact than in the interior, whilst at the same time the brown coating of oxide of iron, which in the course of time grows deeper and deeper towards the interior, illustrates the action of the atmospheric oxygen, to which we have just alluded.

2. A second and no less powerful chemical agency in the formation of soils is the carbonic acid of the atmosphere, which is carried down by the rain. The affinity of carbonic acid for different mineral compounds varies greatly; the action which this acid exercises on limestone, dolomitic rocks, sandstones, clay, basalt, &c., which minerals and rocks differ greatly in composition, is not therefore the same in every case. Limestones, for instance, are easily attacked by rain-water, as the carbonic acid which the water contains dissolves the carbonate of lime, whilst pure sandstones and quartz-rocks are scarcely acted upon by rain-water. Generally speaking, the less compact and less pure a limestone is, the more easily it is attacked by the carbonic acid of the atmosphere. Pure murble, a hard, crystalline variety of carbonate of lime, is little affected by this agency; whereas a limestone containing much clay crumbles to powder with comparative ease, furnishing what is called a marly soil. Most limestones are impure, that is to say, are mixtures of carbonate of lime with clay and other mineral compounds; the more clay a limestone contains, the more readily it absorbs and retains rain, the carbonic acid of the latter, dissolving the lime, leaves erevices and fissures in the rock; the rock thus loses its coherence, and gradually crumbles down to form a marly soil, which always contains a preponderance of clay, and often but small quantities of carbonate of lime. The energetic dissolving action of rain-water on carbonate of lime, which is the principal cause of the formation of all clay marls, is surprising. Some clay marls contain but three per cent. of carbonate of lime, whereas the limestone rocks from which they are derived exhibit no less than eighty per cent. of carbonate of lime. In the formation of stalactites, which are generally found in those caverns which abound in limestone rocks, another familiar example of the dissolving action of rain-water is presented.

Dolomitic rocks are affected by rain-water in the same manner as limestone rocks.—not, however, so energetically.

On felspar, granite, and other minerals, consisting, like many zoolites, of double silicates of alumina and an alkaline silicate, carbonic acid and water exercise a highly-important action. Under their influence these minerals are decomposed into alkaline silicates, which in their turn give rise to silica and carbonate of potash or soda, and into silicate of alumina, the chief mass of clays. In other words, clays are produced, whilst at the same time the highly-fertilising alkaline salts which exist in felspar, granite, trap, and other rocks in an insoluble state, are changed into the easily soluble carbonates, and thus rendered available to the immediate use of plants.

3. In the formation of soils from solid rocks the superior orders of plants and animals take an active share. The seeds of lichens and mosses floating in the air attach themselves to the roughened and partially decomposed surface of rocks, and finding here sufficient food, germinate and throw out roots, which penetrate the little crevices in the rocks like wedges. These widening and multiplying the crevices, hasten the final disintegration of the rock. Mosses and lichens likewise retain the atmospheric water, and keep the surface of the rock moist for a longer time, giving in this manner rain-water a better chance of exercising its dissolving powers on the constituents of the rocks. Insects and other animals of the lower orders collect and feed on the lichens and mosses, and both insects and plants in due time die, decay, and leave all the mineral matter which they have originally derived from the rock behind, mixed with vegetable and animal remains, or humas. During the decay of the inferior plants and animals, carbonic acid and ammonia are given off, which assist the atmospheric water in its dissolving action on the constituents of the rock. A thin layer of a more fertile soil is thus formed, on which plants of a higher order may spring up; in the course of time these die, and enrich and increase the soil in the same manner as the mosses. Thus one small cause assists another, and all together produce the mightiest effects.

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# THEORY AND PRACTICE OF PRUNING.

By Mr. H. BAILEY, GARDENER TO G. V. HARCOURT, Esq., M.P., NUNEHAM PARK, OXFORD.

THE PEACH.

MN forming a handsome and prolific Peach tree, although much is to be accomplished by stopping A and disbudding—i.e. preventive pruning—still the use of the knife in moderation is necessary.

The modes of training to which this tree has been subjected are very various, and many of them very fanciful. We, however, have not now to enter into a description of the vagaries of "Hitt" and "Hayward," or to expatiate upon the far-famed system of the

Montreuil gardeners, whose success, although great and indisputable, is probably owing more to their sunshine than their superior skill—for no amount of skill on the part of the pruner can compensate for immature wood, and the injurious effects of late spring frosts. We shall therefore confine our observations to the mode of training principally adopted in this

country, viz., what is termed fan training.

As the fruit of the Peach is produced upon the last year's wood, (fig. 1, in which cc are blossom buds, with a leaf bud between them,) it is important to adopt such a mode of training as shall ensure a constant succession of young wood. This is, perhaps, not accomplished in a more simple and regular manner by any other mode with which we are acquainted; and as our object is the elucidation of principles involving practical results, rather than to investigate hypothetical fancies, we would refer such of our readers as desire to drink deep of this kind of knowledge to the more copious treatises on the subject by various authors, more particularly to the Encyclopædia of Gardening, by the indefatigable Loudon, where training suitable "to all sorts and conditions" of gardeners may be found.

Let us now proceed to the commencement of the fan-shaped tree, which we will suppose to be what in nursery parlance is called a "maiden" tree; that is, it has made one year's growth from a bud inserted in the stock in the previous year. Fig. 2 represents such a tree, which for the first season is to be headed down to four eyes, so as to produce in the season following four shoots, two on each side. The plant (fig. 3) has now assumed its rudimentary shape, having four branches diverging from the common

centre like the radii of a wheel. In the following season the upper branches must be shortened, so as to produce each three shoots, one in the centre, one on the upper and one on the lower side; and the two lower branches must be shortened, so as to produce two shoots each. This will give ten principal shoots, which, when regularly trained, will form the skeleton of the future tree. These must again be shortened, so as to produce subsidiary shoots, upon which the future fruit is to be borne; always taking care to preserve that which springs from the lowest bud, and not in any subsequent pruning to cut such shoots clean out. Persons who are not conversant with gardening matters generally spoil their future trees, for want of attention to this point. They do not keep them what we call "at home," and in consequence they become naked and unsightly.

In all Peach pruning it is important to know the distinction between leaf and blossom buds, and to make every cut to a leaf bud. The blossom buds are round and prominent, frequently in pairs; and the leaf buds are pointed and narrow. (See fig. 1, in which a a are blossom buds, and b b leaf buds: a leaf bud is very often placed between two blossom buds, e e e.) We

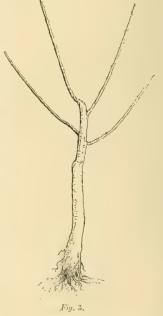


Fig. 1.

have said that the fruit of the Peach is produced upon the shoots of the previous year, which having once borne it, cannot do so again. The grand object of the pruner, therefore, must be to provide an ample and regular supply of them in every part of the tree, and to take care that one part does not deprive another of its allotted nutriment.

When the tree is fairly formed and fruit is expected, great care must be taken to have this succession of young wood; and as the principal arrangement of the young shoots is made during the period of their infancy, (and called disbudding,) we will proceed to offer a few remarks upon it, first explaining by fig. 4 the mode in which the succession is kept up. From A to B represents a piece of two years' old wood, which has borne fruit in the past year; from B to C is wood of last year's growth; and the shoot D is also of last year. If the gardener were to retain all the shoots which he finds, his tree would be too crowded; for he must not forget the importance of light, to which we have so often adverted. He will therefore cut out the new barren wood from A to B, with its point of young growth C, leaving the shoot D to replace it for next season; to be itself replaced by a new shoot from the lowest bud at its base. By observing this rule ad infinitum, trees may be kept well furnished with bearing wood for many years, whilst by neglecting it the finest trees may be spoiled in two years.

When an additional supply of young wood is required, the young shoots must be shortened back to within a few inches of the base. In the case of shoots which have few leaf buds, and those only at the extremities, if this is not attended to, nakedness must result. It is of consequence in fan training that a certain proportion of wood be annually cut back for future supply. Where wood is not wanted, some of the shoots may be retained at their full length; but the greater proportion may be

shortened a little, as the points will often be found unripe.

We now come to the consideration of a portion of preventive pruning, which does, or should do, the greater part of the regulation of the wood of the complete tree in a state of full bearing. We mean disbudding. It must be apparent that if all the leaf buds upon the last year's shoots were allowed to grow uncontrolled, a forest of spray would be produced, which would be weak, watery, and unripe, instead of being hard as mahogany, with plump and well-organised buds; and it is equally true that there is a certain quantum of foliage necessary for the elaboration of sap under the influence of light. All superfluous growths, then, instead of adding to, diminish the store of organisable matter for a future year. Hence the importance of removing them in their young state, and preventing their undue appropriation of those energies of the tree, for which, in their crowded state, they can reciprocate nothing.

We will suppose the fruit of the Peach just formed, and the young shoot from one and a half to two and a half inches in length. This is the period most important in the formation and perpetuation of the supply of young wood. All which are not required for next year's bearing must now be removed, always leaving that one which proceeds from the lowermost bud and the leading one, and thinning the others so as to leave no more than can be exposed to light and air. When a fruit is formed at the base of a shoot which would otherwise be removed as unnecessary, it may be stopped at about two and a half or three inches, as the leaves assist in elaborating matter for its nourishment. Frequently what are called "adventitious" buds are protruded from the old wood, (this occurs most commonly in Royal George Peaches); the careful operator will not fail to regard as a great boon any that are well placed, and to preserve them accordingly.

The great art of pruning consists in so arranging and balancing the parts of a tree that no one attains undue luxuriance, or becomes, on the other hand, too much debilitated from its low position or over bearing. Constant care is necessary to arrest the undue progress of the stronger wood by timely pinching (stopping), and it is the judicious practice of an excellent gardener to stop the points of all the central shoots about the time of the maturation of the fruit, leaving the lower branches untouched, and allowing them to continue their growth.

It is usual, in fan training the Peach, to allow the young wood to be produced both on the upper and lower side of the principal branches. Mr. Seymour, an excellent gardener, departed from this

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rule, training his young wood exclusively on the upper side. We have ourselves also departed from the rule, but on the contrary obtain all our bearing wood from the under or lower side of them; and we venture to recommend this, because in our opinion the tree is balanced better, and produces wood of more moderate growth, the sap always flowing with a vigour proportionate to the vertical direction of the branches.

All who would have good Peach trees must pay great attention to the disbudding process: this, with timely stopping and occasional curtailment of gross feeding roots, will nearly supersede the ordinary amputation practice. If the inquiry which we so often hear made—How should I cut my trees?—were changed into, "How shall I prevent my trees from requiring so much pruning?" cutting and maining would be at a discount, and success more frequent both with amateurs and professional men.

#### THE ROSE GARDEN.

#### By Mr. G. GLENNY, F.H.S.

MAVING selected the best sorts of Roses for our purpose, whether that be for exhibition or as EA permanent ornaments to the garden, we will presume they are, as is usually the case, of one or two seasons' growth from the budding, and the roots more or less bruised and damaged at taking up. Our first aim must be to cut off, with a sharp knife, all damaged ends and bruised portions; for, if we do not, the chances are that the damaged portions will decay and affect the whole plant. And now we come to the planting. Ordinary garden soil will produce the Rose large enough for garden ornament; but for exhibition, where the size of the blooms is more the object than number, two good spade-loads of rotten dung should be forked into the ground for each plant, and mixed with the soil a foot deep, and two feet in diameter; the plant to be placed in the centre. As we will first speak of Standards, we ought to caution all young planters not to bury the roots too much; let the collar of the plant, that is, that part which is immediately above the root, be even with the surface; spread the fibres out all round, and tread the ground as you fill it in very solid; drive a stake into the ground near enough to the stem to support it by tying, or by other fastenings,\* and firmly enough to withstand winds.

As to the season for planting, as soon as the leaf falls will do well, and, weather permitting, any time is good until the buds begin to swell; after which every day makes it worse, or rather increases the risk-because it cannot be denied that plantations have been made very late and have yet succeeded well; but there are many chances against them. Those who have to plant in poor ground should invariably dung it as recommended for show roses, and the most simple way of doing this is to dig out a hole a foot deep and two feet across, mix one or two spade-loads of rotten dung with the soil taken out, and return the mixture to the hole, where, as it will have been increased, it will form a mound. If this be done before the season of planting a few weeks, it will be so much the better. Look then to the root, for which you are to make room; dig no deeper than is necessary to allow of just covering the top of the roots or collar, pressing all the well-bruised earth among the fibres perfectly solid. The ground that will grow a good Cabbage will not fail to grow a good Rose; but the more rich the soil, the stronger the growth and the larger the flowers. It should, however, be remembered that the Briers on which most standard Roses are budded grow very strong in the midst of thorns and brambles, on banks and in places impoverished by other plants and weeds, which would choke every thing else, and that, when budded in their original locality, they will make large heads the first season. We remember to have heard a man accused of budding Briers in the woods and wastes, and taking them up at the end of the season, by which they sustained all the check after the head had grown, instead of before budding; and, so far from denying it, he maintained it was the best plan. Now the Rose stock, or Brier, sustains so great a shock in consequence of the mutilation of the roots when first torn out of the ground where it had grown perhaps for years, that notwithstanding every pains may be taken, and the head taken off to reduce it to a single rod, it may die. It stands to reason, then, that if this mutilation takes place when there is no opportunity of compensating more than by the mere pruning of the worked growth, bad health, weakly growth, or death must inevitably follow.

In pruning the Roses when newly planted, we are to take away as much as we can without injuring the form of the intended head. If there be only the one shoot from the bud, cut it down to

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<sup>•</sup> The Rose Girdle, a registered invention by an amateur Rose-grower, is the most complete thing yet attempted. A zine band goes round the stake and the Rose, and fasters with a nut and series. The name of the Rose can be written on the band.

two eyes. If there be a regular head, cut away every shoot down to the lowest eye that points outwards or downwards, and cut all weak or thin shoots, all that come in the way of a better, clean back to the base; leave only such branches as will tend to throw out shoots in a proper direction to form a good head; and remember that a branch of one season's growth is, if the Rose tree be in health, from one to three feet long. When the buds begin to push, rub off all that grow inwards, all that would cross other branches, all that are weakly, and all that would tend to crowd the head. Many persons let them grow as they will, and at the next pruning time follow the common instructions for pruning, "to cut out all useless and all weakly branches," &c.; but it is far better to rub off all useless and weakly buds, because the strength is then thrown into the growth you want.

We are confining ourselves now to new plantations, for it is in these that the grower's difficulty is to be found. Once establish a Rose garden, and let the Roses attain maturity, and all his difficulties cease. As the growth proceeds, examine every bud, every curled leaf, every shoot; for the maggot, if not detected at once, destroys the vitality of the flower bud. Continue looking over them from day to day; syringe them with a very fine rose forcibly applied—it destroys the green fly, thrip, and many other enemies, and it cannot be too often applied until the blooming time. We say that constant syringing prevents the green fly, and with perseverance they may be got rid of; but if they get the upper hand, so that the syringe will not disturb them, fumigation with tobacco smoke, or syringing and washing with tobacco water, must be resorted to.

# NOTES CULTURAL, CRITICAL, AND SUGGESTIVE.

Thermic Scale of Cultivation.—If we form a thermic scale of different kinds of cultivation, beginning with the hottest climate, and proceeding from Vanilla, Cacao, Spices, and Cocoa Nuts, to Pine Apples, Sugar Cane, Coffec, fruit-bearing Dates, Cotton, Citrons, Olives, Sweet Chesnuts, and Vines producing drinkable wines, an exact consideration of their various limits, both on plains and on the declivities of mountains, will teach us that in this respect other climatic relations than those of mean annual temperature must be sought. Taking only one example—the cultivation of the Vine the production of drinkable wine requires not only a mean annual temperature of 93° Cent. (or 49° 2' Fahr.); but also a winter temperature of above 0° 5' Cent. (32° 8' Fahr.), followed by a mean summer temperature of at least 18° Cent. (64° 4' Fahr.). At Bordeaux, in the valley of the Garonne, in lat. 44° 50', the mean temperature of the year, the winter, the summer, and the autumn, are respectively 13° 8', 6° 2', 21° 7', and 14° 4' Cent. (56° 8', 43° 2', 71°, and 58° Fahr.). On plains in the vicinity of the Baltic, in lat. 52%, where a wine is produced which, though it is used, can searcely be called drinkable, these numbers are respectively 8° 6′, 0° 7′, 17° 6′ and 8° 6′ Cent. (47° 5′, 30° 8′, 63° 7′, and 47° 5' Fahr.). If it should appear strange that these great differences in the influences of climate on the production of wine do not show themselves more markedly in the indications of thermometers. it should be remembered that an instrument suspended in the shade, and carefully protected from the direct rays of the sun, and from nocturnal radiation, cannot show at all seasons of the year, and during all the periodical changes of temperature the true heat of the surface of the ground, which receives the whole effect of the sun's rays.—(Humboldt's Cosmos.)

Degeneration of Fruits.—In North America there are neither apple, pear, nor peach-trees, of the same sorts as our own, that have not been introduced there. The Europeans some three hundred years ago took over the seeds of these trees; but so far from yielding what they yield us, they produced, at least in Virginia, as a first generation, trees with wild and austere fruit, and it was not eatable by those accustomed to better things at home. The second generation, sprung from the first American seeds, was not so bad as the first. Each generation was better than its predecessor, but their fruit is still inferior to our own; and what is very curious, the best of theirs differ from ours in taste and essence. These facts, collected by M. Poiteau in Virginia forty-five years ago, show what modifications can be produced by a succession of generations in plants derived from the same seed. If it be objected that the seeds of the fruit-trees originally sent to Virginia did not in this country produce such good fruit as they do at present, still the great fact remains, that the seeds when sown in Virginia yielded something different from what they then yielded in Europe. We see, then, how the new conditions in which fruit-trees were placed in North America gave rise to two principal results: 1. By depriving this fruit of the quality it had acquired by European cultivation; 2. By making it undergo, in the course of successive generations, modifications different from those of the fruit cultivated by us.—(Chevreul in Journ. Hort. Noc., vi. 89).

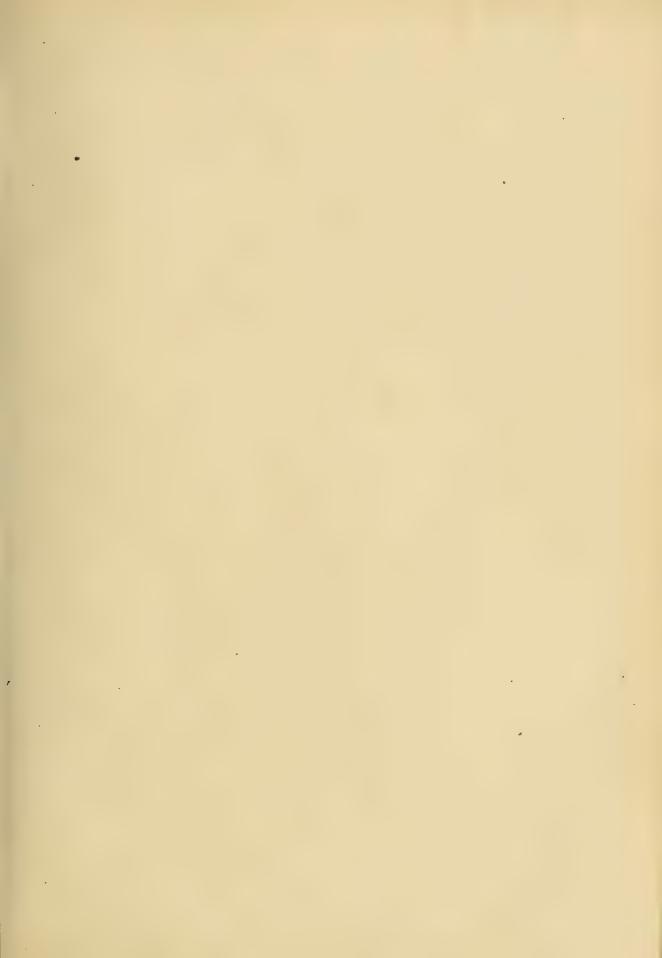
Destroying Weeds upon Walks.-Among the objects of horticultural interest at the Industrial Exhibition, is a machine for destroying weeds, moss, lichens, &c., on gravel-walks, court-yards, &c., invented by Mr. Fleming, of Trentham. This machine may be described as a large wroughtiron boiler, fitted upon wheels, with a fire-place in the centre for the purpose of heating the water to a boiling temperature. Connected with the boiler is a spring valve and delivery pipe, similar to those used upon common watering-carts, through which boiling salt-water is delivered in a continuous and gentle shower; the salt being mixed in the proportion of two pounds to each gallon of water. This, at Trentham, is found to be very effectual, and the expense of the application a mere fraction, compared with the expense of hand-weeding. The contrivance is ingenious, but we imagine the same end might be attained in a more inexpensive, yet equally effective, manner. To a common watering-barrow or cart we would attach, either permanently or so as it could be removed, a wroughtiron cylinder of the depth of the tub, and some nine or twelve inches in diameter; in this cylinder we would place a grating some short distance from the bottom, and over it place the fire and fuel, and regulate the combustion by a valve below the fire. In this way the water would be quickly heated: any strong cask or barrel could be converted in a short time, at a comparatively small expense, and the material would be much more durable, as it is well known that salt-water is very destructive to all metallic substances. Such a moveable heating apparatus would be exceedingly useful at all times in a garden, not only for destroying weeds, but also for providing hot water for numerous purposes, such as watering Pines, destroying insects, washing plants, or for forwarding early spring crops. machine in the Exhibition will be found in class 9, and numbered 253.

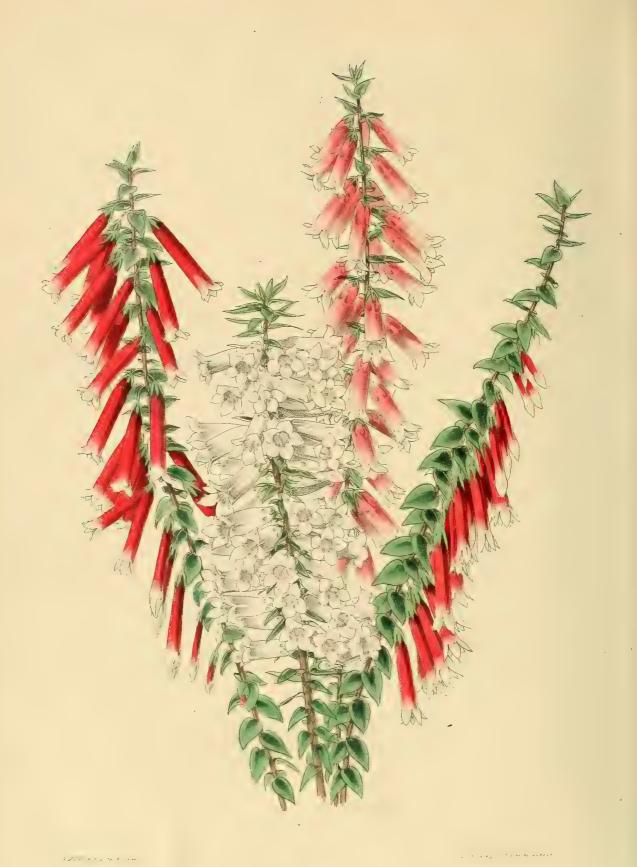
Correa viridiflora alba—one of Mr. Gaines' seedlings—is a very pleasing variety, with dark green obtusely elongate-ovate leaves, densely hairy beneath. The flowers are fully an inch long, with a cylindrical tube, which is white, and a limb of spreading ovate segments, which is green. The white tubes, tipped with pale green, hanging among the deep green foliage, have a very pretty effect.

The Bigarreau noir de Legraye Cherry is among the best Bigarreaux in the neighbourhood of Liége. It is a new variety, and so prolific that it frequently bears eight fruit in a single fascicle. The leaves are about four inches long, oval, lanceolate, acuminate, toothed, of a lively green above and yellowish below, and having two red glands at the point of attachment to the petiole. The peduncles measure about an inch and a half, and are deeply inserted in the fruit, which is somewhat flat, roundish, slightly conical. The skin is glossy and deep purple; the flesh red or deep purple, so soft as to distinguish it from all others, and of a delicious flavour. We have named it Bigarreau noir de Legraye in honour of the raiser, M. Legraye, of Liége.—La Griotte Rouge de Stavelot is extensively grown by the fruit-growers of Liége. The tree is of an upright habit, the leaves of the ordinary form, the petioles brownish red, and the glands small. In general the fruit is solitary, but sometimes there are two on one peduncle, which is from an inch and a half to two inches in length. The taste is somewhat acid, but grateful. This Cherry is remarkably large, and is, on the whole, a most excellent variety.-Toupie d'Henrard is a remarkable variety, which was exhibited at the general meeting of the Horticultural Society at Liège last year. It has been raised by M. Denis Henrard, lecturer on horticulture, &c., at the University of St. Walburge. The fruit is from an inch to nearly an inch and a half in length, and about three quarters of an inch broad; it is oblique above, next the stalk, the side of the cavity being higher at one side than the other. The fruit is somewhat flat, perfectly heart-shaped, and pointed. The skin is glossy, of a vinous deep red, and veined; the flavour grateful and sweet. This very singular Cherry was raised from seed by M. Henrard.—(La Belgique Horticole).

Pelargonium Odoratum variegatum, raised by Mr. Gaines, is one of the prettiest little variegated plants we have lately seen. It is apparently a variegated sport of the dwarf fragrant variety called Prince of Orange, having the same kind of foliage, except in its being variegated, similar light-coloured blossoms, and the same fragrance in the leaves. This latter quality will make it useful for bouquets. It is a dwarf and compact grower, the leaves boldly variegated with white, and must, we should think, have a good effect when "bedded out." It seems to be particularly well adapted for planting as an edging to beds of showy plants, when these are surrounded by grass.

The Nectarine a smooth Peach.—Mr. Calver of Royalton (U.S.) some five or six years ago planted a few thousand peach stones. The plants were in due time budded, except the end one of each row, which was left as "a marker." One of these last year produced a crop of bona fide Peaches and Nectarines; both were of small size, but well flavoured.—(Horticulturist, vi. 243).





### SEEDLING EPACRISES.

Nat. Order .- EPACRIDACEE.

Generic Character.—Epacris, Smith.—Calyx five-parted, coloured, with many bracteoles of the same texture as the calyx. Corolla hypogynous, tubular; limb five-parted, spreading, smooth. Stamens five, inserted on the tube of the corolla, included or rarely exserted; filaments thread-like; anthers peltate above the middle. Hypogynous scales five. Ovary five-celled, cells with many ovules; style simple; stigma obtuse. Capsule five-celled; placentas adherent to the central column. Seeds numerous.—Low shrubs, common in New Holland, rare in New Zealand; generally glabrous; leaves scattered, stalked or sessile by the simple base; flowers axillary, very often forming leafy spikes, white or purpurascent.—(Endlicher Gen. Plant., 428s.)

EPACRIS CONSPICUA (Fig. 1).—Habit and foliage of E. grandiflora; flowers large, bright crimson-scarlet; the throat and limb white.

E. GRANDIFLORA RUBRA (Fig. 2).—Habit and foliage of E. grandiflora; flowers large, deep crimson; the throat and limb white.

E. Kinghornii (Fig. 3).—Habit and foliage of E. grandiflora; flowers light rose-colour, paler upwards; the limb pure white.

E. HYACINTHIFLORA CANDIDISSIMA (Fig. 4.)—Habit and foliage of E. variabilis; flowers pure white, with a wide tube.

ESCRIPTION.—The varieties represented by our figures 1 and 2 are very decided improvements on Epacris grandiflora, agreeing with it in habit and foliage, but differing in the increased size of the flowers, and in colour; conspicua being a bright crimson-scarlet, and grandiflora rubra a deep rose-crimson; the former lighter coloured, the latter deeper coloured, and both of a richer hue than E. grandiflora. In these varieties the corolla tube is smooth and terete, as in that species, and not prismatic as in miniata. E. Kinghornii, our figure 3, has the habit and foliage of grandiflora, but flowers possessing more of the character of variabilis, the tube of the corolla shorter, prismatic, and deeply pitted at the base; the tube is of a clear light rose colour at the base, becoming paler upwards, the limb being pure white: it is in the way of Attleeana, but better coloured, and having the pure white tips conspicuous. E. hyacinthiflora candidissima (figure 4) is of quite another stamp; the habit and foliage resembling those of E. variabilis, with additional size and vigour, and the corollas of the same short-tubed form, but broader, prismatic, pitted, and of a very pure white; it is the finest white we have seen.

History, &c.—We are indebted to Mr. Kinghorn, gardener to the Earl of Kilmorey at Twickenham, and to Messrs. Henderson of Pine Apple Nursery, for the opportunity of figuring these desirable greenhouse shrubs. The varieties conspicua, grandiflora rubra, and Kinghornii, are seedlings raised by Mr. Kinghorn, and exhibited by him during the past spring; the two former were raised from miniata, crossed with grandiflora, the latter from miniata, crossed with a variety called Waltoni. The variety hyacinthiflora candidissima was raised by W. H. Storey, Esq., of Whitehill, in Devonshire, who has favoured us with the annexed particulars of its history:—

"The parentage and subsequent history of these flowers (hyacinthiflora and candidissima) may be told in a few words. In 1841, I flowered above five hundred seedling Epacrises, crosses between old grandiflora, impressa, and variabilis. Of this lot, some half dozen I thought worth naming; they were coruscans, elegantissima, grandiflora rosea, coccinea major, and one or two others, the names of which I forget,—the whole, I believe, having long since been consigned to the 'tomb of all the Capulets.' Amongst the discarded plants was one (a bad variabilis) that appeared to have two distinct habits, and different kinds of foliage; the branch, with larger and more robust growth, was only then showing bud. I put the plant aside, and as I watched it day by day, was much surprised to perceive that I was going to have a much larger flower than any in cultivation, and totally different from the main plant; -hyacinthiflora was the result. Having propagated from this sporting branch, in 1844 or 1845 Messrs. Henderson of Pine Apple Place saw the flower, and purchased the stock. In the mean time, I had seeded the parent plant once (1844) very sparingly, the produce being only ten or twelve plants; the greater part of these bloomed in the spring of 1847, one of them being candidissima, the rest too much like the male parent to be of any use. The following year (1848) another white bloomed, more pure in colour and quite as large as candidissima; this I have not parted with, conceiving it to be only a fine variety of that flower. One thing has struck me as being very remarkable: no white flower can claim paternity to either of these seedlings."

CULTURE.—Next in importance to the Erica, the Epacris claims a place as one of the most useful families of hard-wooded plants; and blooming, as some of them do, almost every month in the year, and more especially in the dull winter months, they yield us flowers at a season when they are doubly valuable and interesting. Originally this was a rather limited genus;

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but from the vast quantities which have been introduced, or raised from seed, within the last ten years, their name, at the present time, is legion; but we must in justice add, the varieties are much more numerous than distinct. At the risk of a charge of repetition, we re-state the rules which ought to guide every person who hopes to be successful in raising superior seedlings

in this or any other class of plants.

First, then, as a starting point, the parents should be of good habit, free growth, and strong constitution; they should produce strong short-jointed wood, for as the Epacris flowers from the joints, the closer they are together the more likely will the plants be to produce compact spikes of flowers. Secondly, in cross-breeding, the colours used should be rich and pure, and as an example of pureness, we would name the white variety figured upon the adjoining plate, and as a rich colour, E. Copelandii, or the best variety of miniata. These kinds crossed would be almost sure to throw some fine things, as they are not only of good habit and colour, but they also produce flowers of very tolerable form and substance—for when habit and colour is obtained, the form of the flowers is the next consideration. Persons of a more strictly geometrical taste than ourselves may take form as the first consideration, and among plants which are grown for their flowers to be shown in a cut state, they may be right; but when the entire plant is taken into consideration, fine habit, rich foliage, and good colour, should take precedence of form, but if the four can be combined, then perfection is attained.

We cannot quit this subject of cross breeding without suggesting that there is yet a wide field open among Epacrises for the cross breeder, and that it is quite possible to carry the high colours of some of the impressa varieties into the summer blooming kinds; and hence we see no reason why the rich colours of miniata or Copelandii should not be engrafted upon the light and elegant foliage of pulchella, or why we should not have a scarlet variety of paludosa, heteronema, or ceræflora. Of course it would be a work of time, but the material is at hand, and the work would be the most interesting that an enthusiastic amateur could undertake. Of all the pleasing parts of gardening, that of raising seedling varieties is the most exciting, for, from the time the seed becomes a tiny plant, until it arrives at blooming maturity, there is constant change; at one time you think it will be like this, at another like that, and, as the day approaches for the opening of the first blossom, the excitement becomes more intense, and "hopes" which are buoyed up to-day, become "fears" to morrow, while the finale will frequently show that those plants upon which we had pinned our faith are valueless, and that some apparently worthless "wee thing" will prove the real California after all. One cardinal point in cross-breeding must never be lost sight of, and that is to improve the constitution of the plant at the same time that you improve the flower, for, unless you do this, your work will have been labour lost and the plant you have raised will be valueless.

Of all the Epacrises the varieties of impressa and campanulata are the best for winter blooming; but, for purposes of exhibition, E. paludosa, heteronema, ceræflora, pulchella, and p. nana, grandiflora, miniata, and Mr. Kinghorn's varieties figured on the annexed plate, are the most useful. E. Attleeana for an early show is useful, but it requires severe stopping to get good bushy plants. Mr. Hally, of Blackheath, also raised a white small-flowered kind from imported seed, which has the scent of hawthorn and which he calls odorata alba; it is a summer blooming kind, producing an abundance of flowers in long spikes.

In cultivation, the Epacris requires much the same treatment as Heaths, that is, a good free open peaty soil with plenty of grit and sand, liberal treatment during the growing season, and well ripening in the autumn to ensure bloom. In potting give plenty of drainage, reduce the soil into a tolerably fine state, and pot the plants firmly. The best place for the plants after potting is a tolerably close frame, but here they must have abundance of air when they get established. When selecting plants, take care that they are strong, bushy, and well rooted, with the roots in a fresh vigorous state. Such plants may receive a liberal shift, but, if they are at all stunted, a small shift will be preferable. Such kinds as impressa, campanulata, miniata, &c., require to be closely cut in after blooming, so as to get young vigorous wood from the centre, and this, if it is intended for blooming, should be allowed to grow at full length; but, on the first formation of a young specimen, the shoots must be stopped to form a bushy plant;

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and hence bloom must be sacrificed for a season. When the plants are thoroughly established, to ensure their blooming properly they must be exposed to the full sun from the beginning of July until September; in fact, they should be placed in an open part of the garden where both sun and air can act upon them on all sides. Thus treated, such kinds as grandiflora and miniata may be made to bloom regularly; and the more thoroughly the wood is matured, the brighter is the colour of the flowers likely to be.—A.

# THE GENERA AND SPECIES OF CULTIVATED FERNS.

BY MR. J. HOULSTON, ROYAL BOTANIC GARDEN, KEW; AND MR. T. MOORE, F.L.S., &c.

Sub-order—Polypodiace.E: Tribe—Pteride.E. (Sect. I. continued).

ORYOPTERIS, J. Smith (Pteridis sp. of Authors).—Named from dory, a spear, and pteris, a Fern, from the form of the fronds in one of the species.

Sori linear, continuous, marginal. Indusium narrow. Venation nearly uniform, internal, reticulated, forming elongated oblique areoles. Fronds from eight to twelve inches high, simple, cordate, lobed or digitate-palmate,

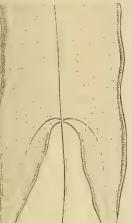


Fig. 36.

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glabrous, and coriaceous; stipes and costa ebeneous.—Habit is the primary distinction that separates the few species arranged under this genus, from the Litobrochias. In the coriaceous texture of the fronds, and in the smooth ebeneous stipes, they agree with many species of Platyloma and Cassebeera, but they are readily distinguished from those genera by having a reticulated venation. Fig. 36 represents part of a frond of *D. sagittifolia* (med. size).

1. D. sagittifolia, J. Smith: Raddi.—A very elegant evergreen stove Fern, from Brazil. Fronds simple, sagittate, acute, rather erect, nearly a foot high, coriaceous, bright green; terminal, adherent to a somewhat creeping rhizome. Sori linear, continuous; indusium narrow. Fronds nearly all fertile.

2. D. palmata, J. Smith: Willdenow.—A beautiful dwarf evergreen stove species, from Brazil. Fronds glabrous, coriaceous, digitately-palmate, drooping, one foot high, segments linear-acuminate, pinnatifid, and bright green. Sori linear, continuous; indusium plane. Stipes squamiferous near the base, terminal, adherent to a somewhat creeping rhizome.

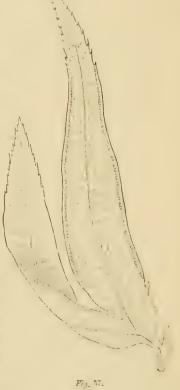
3. D. collina, J. H.: Raddi.—An elegant evergreen stove Fern, from Brazil. Fronds glabrous, coriaccous,

palmate, bright green, six to ten inches high; the sterile ones three or five lobed, with roundish blunt obtuse segments; the fertile five-parted, with linear-lanceolate pinnatifid segments, the inferior elongate. Sori linear, continuous; indusium plane. Fronds terminal, adherent to a somewhat creeping rhizome.

ITOBROCHIA, Presl. (Pteridis sp. of Authors).—Named, probably, from litos, slender, and brocho, to swallow up or absorb; the seri being covered by a narrow indusium.

Sori linear, continuous or interrupted, marginal. Indusium linear, narrow. Venation external, elevated, arcuately or angularly anastomosing, producing unequal arcoles, often only reticulated near the midrib or margin. Fronds from one to eight or ten feet high, pinnate or bi-tripinnate; ultimate pinnae usually pinnatifid.—This genus contains a considerable number of species, chiefly found in the tropics, a few, however, being met with in the extra-tropical regions of both hemispheres. They have generally large branching compound fronds of a flaceid texture, with a superficial anastomosing or reticulated venation, by which they are distinguished from Doryopteris. Fig. 37 represents a pinna of L. denticulata (med. size).

1. L. grandifolia, J. Smith: Linnaeus.—A tall evergreen stove Fern, from Jamaica. Fronds creet, pinnate, eight or ten feet high; pinnæ membranous, glabrous, of a light green,



petiolate, linear-acuminate, about one inch broad and eighteen long. Sori linear, continuous. Rachis and stipes pubescent, lateral, adherent to a scaly creeping rhizome.

- 2. L. denticulata, Presl: Swartz.—An evergreen stove Fern, from Brazil. Fronds glabrous, triangular, from one to one and a half foot high; lower branches sub-pinnate, with the inferior segments bipartite; upper part pinnate, with the inferior segments divided; sterile pinnæ broad, oblong, acuminate, dull green, decurrent at the base, serrate at the margin, with spinulose teeth. Fertile fronds erect, of the same form as the sterile ones, terminal, adherent to a fasciculate rhizome. Sori linear, continuous.
- 3. L. leptophylla, J. Snith: Swartz (Pteris spinulosa, Raddi).—An ornamental evergreen stove species, from Brazil. Sterile fronds glabrous, triangular, bipinnatifid, tripinnatifid below, one foot long, with linear acuminate, light green pinnæ, decurrent at the base, and serrate at the margin, with long spinulose teeth. Fertile fronds glabrous, erect, triangular, two feet high, bi-tripinnate, with linear narrow acuminate distant segments, serrate at the apex. Sori linear, continuous. Fronds terminal, adherent to a fasciculate rhizome.
- 4. L. polita, J. Smith: Link.—An ornamental evergreen stove Fern, from Brazil. Fronds glabrous, deltoid, sub-tripinnatifid, three to four feet high, of a bright green; pinnæ oblong-linear, acuminate; segments oblong-obtuse and serrate at the apex. Sori linear, continuous. Stipes scaly at the base, terminal, adherent to a creeping rhizome.
- 5. L. vespertilionis, J. Smith: Labillardière.—A free-growing evergreen greenhouse Fern, a native of New Holland. Fronds glabrous, two to three feet high, tripinnate, of a light yellowish green, and glaucous beneath; pinnæ opposite, lanceolate; pinnules opposite, sessile, oblong-linear, acuminate, with roundish oblong-obtuse membranous segments, decurrent at the base. Sori oblong-linear. Rachis and stipes glaucous, scaly at the base; lateral, adherent to a scaly creeping rhizome.

# ONCHITIS, Linnæus.—Name derived from logehe or lonche, a lance; alluding to the form the fronds.

Sori marginal, oblong or linear-arcuate, produced on the apices of four or five convergent venules, which terminate in the sinus of the segments. Indusium linear; venation reticulated, forming unequal areoles. Fronds from two to six feet long, pinnate or bipinnate; pinnæ sinuose or bipinnatifid, and usually pubescent.—The few species belonging to this genus, of which there is only one at present in cultivation, have a very close affinity with Litobrochia, agreeing with them in habit and venation; the only character by which they are distinguished is the position of the sori, that of Lonchitis being situated in the sinus of the segments, assuming the form of the segment of a circle, whereas that of Litobrochia is linear, and occupies more or less of the sides of the segments. Fig. 38 represents a portion of a pinna of L. pubescens (med. size).

1. L. pubescens, Willdenow.—An arborescent evergreen stove Fern, from the Mauritius. Fronds hairy, bipinnate, two to four feet long; pinnæ lanceolate acuminate; pinnules oblong acuminate, opposite, sessile, membranous, pinnatifid, light green, with round blunt segments. Fronds terminal. Sori linear-arcuate, in the sinus of the segments of the pinnules. This Fern is not common in cultivation, being at present confined to very few collections. It was introduced a few years ago to Chatsworth, from the Continent.

MAMPTERIA,\* Prest (Pteridis sp. of Authors).—Name derived from kampylos, a curve, alluding to the curved costal venules.

Sori linear, continuous or interrupted, occupying the sides of the segments only. Indusium plane, linear. Veins forked; venules direct, the inferior pair arcuately, or transversely anastomosing, forming a single row of elongated costal arcoles, the superior ones free, and combined at their apices by a transverse sporangiferous receptacle. Fronds from three to five feet high, glabrous, pinnate or bipinnatifid.—The cultivated representatives of this genus are but few in number, one only being at present in cultivation. In habit, texture, and circumscription of fronds, they so closely resemble Pteris, as to be scarcely divisible from them, the only technical character that can be pointed out being a solitary row of anastomosing or arcuate costal venules, which may be considered

• We have thought it desirable to include this genus in our enumeration, rather in deference to the opinions of others, than as accordant with our own. The genus was established by Presl, on a few species of Pteris having a solitary row of costal arcuate venules; and Mr. J. Smith, in his "Enumeration of Ferns Cultivated in the Royal Gardens at Kew," in 1845, following up the idea that this slight variation of venation was sufficient ground for generic distinction, has adopted it. But taking into view the creation of some species of Adiantum, where a partially anastomosing and a free state of venation are found in the same frond, it is evident that such variations cannot be of sufficient importance for purposes of generic distinction. Moreover, if this single character were here considered sufficient on which to found a genus, two others at least must be established on precisely similar characters—one in Stenochlana, as may be seen by our fig. 23 (p. 130), the other in Hemitelia; and this, instead of facilitating the study of Ferns, would only render it the more intricate. In our opinion, therefore, Campteria ought not to be retained, but the species should revert to Pteris.



Fig. 38.

as forming the transition from the free veins of true Pteris to the reticulated form that characterizes Litobrochia, Fig. 39 represents a portion of a pinna of *C. biaurita*, (med. size).

1. C. biaurita, J. Smith: Linnæus.—An ornamental evergreen stove Fern, native of the West Indies. Fronds glabrous, triangularly elongate, three to four feet long, light green, pinnate; pinnæ lanceolate, deeply pinnatifid, petiolulate, with the apex caudate and entire; lower pair bipartite; segments linear, obtuse, sub-falcate. Stipes half the length of the frond, with a few scattered scales near their base; terminal, adherent to an erect fasciculate rhizome.

TERIS, Linneus.—Name derived from pteron, a wing; in allusion to the appearance of the fronds.

Sori linear, continuous or interrupted, usually occuping the sides of the segments only. Indusium plane, linear, its base often sporangiferous. Veins forked; venules direct, their apices combined by a sporangiferous receptacle. Fronds from one to eight or ten feet high, pinnate, bipinnatifid or decompound, glabrous, or pilose.—This genus, as originally characterized, contained nearly 200 species, amongst which were collected a variety of plants, widely differing in habit, aspect, texture, and circumscription of fronds; by being divested of all forms possessing a reticulated venation, it is considerably reduced, although it now contains a large number of species which, with few exceptions, are tall coarse-

growing plants. Its nearest affinity is with Platyloma, from which the most obvious distinction is, its narrow sporan

obvious distinction is, its narrow sporangiferous receptacle. Fig. 40 represents a pinna of *P. felosma* (med. size).

Fig. 39.

1. P. longifolia, Linnæus.—An ornamental evergreen stove Fern, native of Nepal, the Philippine Islands, and the West Indies. Fronds broadly lanceolate, two to two and a half feet long, pinnate, of a dull green; pinnæ linear, narrow, often seven inches long, petiolulate, base auriculate; margin of the sterile pinnæ serrate. Sori continuous, intermixed with hairs; indusium plane. Stipes densely covered with narrow light-coloured scales, and some scattered throughout the rachis. Fronds terminal, adherent to a creeping rhizome.

2. P. cretica, Linnaus.—An evergreen stove or greenhouse Fern, having an extensive geographical range, being found in the East and West Indies, Mexico, China, and the south of Europe. Fronds glabrous, from one to one and a half foot long, of a lively green, pinnate; pinnæ of the sterile fronds linear-lanceolate, lower pair bipartite, petiolulate, with the margin serrate; fertile segments linear, narrow, often six inches long, and serrate at the apex. Rachis and stipes of a straw colour, especially when dry. Fronds lateral or terminal, adherent to a short creeping

— β. heterodactylon.—This variety is distinguishable from the common form by the pinnæ being all bipartite, the fronds arranged round a sealy crown, and the stipes and rachis being of a purplish brown colour. It is a native of India.

3. P. serrulata, Linnaus.—A dwarf evergreen stove species, from the East Indies. Fronds glabrous, slender, a foot or more long, of a light green, pinnate; pinnæ linear, somewhat pendulous; the lower pair or more bipartite or bipinnatifid and petiolulate; the upper ones adnate, and decurrent at their inferior base; segments of the fertile fronds linear, narrow. Sterile fronds scrate at the margin. This is one of the commonest Ferns in cultivation; the fronds are nearly all fertile, and are lateral or terminal, adherent to a short creeping rhizome.

— β. minor.—A dwarf evergreen stove Fern, with a peculiar rugose aspect. For specimens of this singular little Fern, as well as for living plants to the Royal Botanie Garden, Kew, we are indebted to Mr Hender-

son, gardener at Wentworth House, Yorkshire, who kindly communicated them, accompanied with a note, which we cannot do better than here introduce:—"The spores from which this little plant was raised I received from Professor Henslow, who said that the plant was collected in the islands of the Indian Sea; it has the appearance of a pigmy variety of P. serrulata, but it preserves its character when raised from spores." It has been in cultivation several years, and seldom attains more than the height of three inches.

4. P. umbrosa, R. Brown. -An ornamental evergreen greenhouse Fern, from New South Wales. Fronds

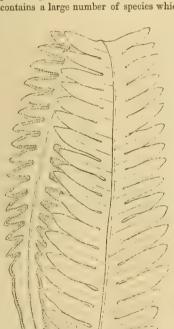


Fig. 40.



glabrous, two to three feet high, bright green, bipinnate below, pinnate above; segments of the sterile frond linear-acuminate, decurrent at the inferior base, the margin serrate; fertile segments linear, narrow, often ten inches long, serrate at the apex, and decurrent at the inferior base. Fronds lateral or terminal, adherent to a short creeping rhizome.

5. P. felosma, J. Smith.—A large coarse-growing evergreen stove Fern, from Jamaica. Fronds glabrous, triangularly elongate, three to four feet long, dull green, pinnate; pinnæ linear-lanceolate, deeply pinnatifid, petiolulate, apex entire and caudate; the lower pair bipartite; segments linear, entire, obtuse, slightly falcate; costa spinulose on the upper side. Stipes scaly near the base, half the length of the frond, terminal, adherent to a fasciculate erect rhizome. This species is not readily distinguished from the following, when both are dry.

6. P. sideata, Hort. Berolensis.—An evergreen stove species, from Jamaica. Fronds glabrous, triangularly elongate, three feet long, deep green, pinnate; pinnæ linear-lanceolate, deeply pinnatifid, petiolulate, apex entire and caudate; the lower pair bipartite; segments linear, entire, obtuse, subfalcate; costa spinulose on the upper side. Stipes scaly near the base, half the length of the frond, terminal, adherent to a fasiculate erect rhizome. This species closely resembles the preceding, but is always of a smaller size, and destitute of the unpleasant odour so prevalent in that.

7. P. Kingiana, Endlicher.—An ornamental evergreen greenhouse species, from Norfolk Island. Fronds glabrous, three feet long, sub-bipinnate, yellowish green; pinnæ linear lanceolate, drooping; lower pair bipartite and petiolulate; segments linear-acuminate, repand, margin serrate; costa spinulose on the upper side. Stipes green, scaly near the base; lateral or terminal, adherent to a short creeping rhizome.

8. P. crenata, Swartz (P. chinensis, Hort. Angl.).—An evergreen stove Fern, from the East Indies. Fronds glabrous, one to one and a half foot high, bipinnate especially below, dull green; pinnules of the sterile frond oblong-ovate, decurrent at the inferior base, crenato-serrate at the margin; fertile frond erect; pinnules linear-acuminate, narrow, sub-petiolate, and decurrent at the inferior base. Fronds lateral, adherent to a short creeping rhizome.

9. P. lata, Link.—An elegant evergreen stove species, from Brazil. Fronds glabrous, deltoid, three-branched, two and a half to three feet high, bright green; branches pinnate, somewhat drooping; pinnæ linear-lanceolate, deeply pinnatifid, petiolulate or decurrent at the inferior base, apex entire and caudate; segments linear-acuminate, repand, spinuloso-serrate at the apex; costa spinulose on the upper side. Fronds lateral or terminal, adherent to a creeping rhizome.

10. P. hirsuta, J. Smith.—A fragile membranaceous evergreen stove Fern, from Jamaica. Fronds triangularly-elongate, bipinnate, four to six feet long, light green, and hairy throughout; pinnæ linear-lanceolate, somewhat drooping; rachis winged; pinnules linear oblong acuminate, pinnatifid; segments oblong obtuse, slightly falcate, and rounded at the apex. Sori linear, continuous, intra-marginal. Indusium sinuose, slightly fringed. Stipes very stout, lateral, adherent to a thick creeping rhizome.

11. P. heterophylla, Linnæus.—An elegant evergreen stove Fern, from Jamaica. Fronds deltoid, glabrous, one foot long, yellowish green, bi-tripinnate; pinnules of the sterile frond ovate, obtuse, attenuated at the base, deeply serrate at the margin; fertile pinnules oblong-obtuse, and attenuated at the base. Fronds adherent to a somewhat tufted rhizome.

12. P. arguta, Vahl.—A very graceful evergreen greenhouse species, from Madeira, the Canaries, and St. Helena. Fronds glabrous, spreading, somewhat deltoid; chartaceous, pale green, three to five feet long, bi-tripinnate; pinnules linear-acuminate, segments linear-oblong, obtuse, margin dentate. Stipes half the length of the frond, and, as well as the rachis, of a shining brown, especially when mature; terminal, adherent to a somewhat erect rhizome.

13. P. tremula, R. Brown (P. chrysocarpa, Link).—An ornamental evergreen greenhouse Fern, native of New South Wales and New Zealand. Fronds glabrous, slender, deltoid, three feet long, bright green, tri-quadripinnate; pinnules linear, caudate at the apex; segments oblong-linear, narrow, rather blunt at the apex, crenately toothed at the margin. Stipes half the length of the frond; terminal, adherent to a somewhat creeping rhizome.

14. P. aquilina, Linnœus.—A tall coarse-growing deciduous hardy Fern, indigenous to Britain, and extensively distributed throughout Europe, Asia, and North America. Fronds somewhat three-branched, pubescent, especially beneath, bi-tripinnate, from four to eight feet high, pale green; pinnules linear-lanceolate, superior undivided, inferior pinnatifid; segments oblong-obtuse, and slightly concave. Sori continuous round nearly every sinuosity of the pinnæ. Indusium divided at the free margin into capillary articulated segments. Fronds lateral, adherent to a creeping elongated subterraneous rhizome, often penetrating to the depth of several feet. There are two forms of this species met with in a wild state in this country—one with the ultimate pinnules pinnatifid, the other with all the pinnules entire.

— P. caudata, Linnaus.—This name is retained in catalogues as that of a distinct species, from North America; yet, if the plant is examined in a living state, it is found not to be specifically different from our indigenous P. aquilina, and fronds gathered from our native species under many circumstances cannot be distinguished from the North American and other forms. Through the kindness of R. Heward, Esq., F.L.S., we have selected from his extensive herbarium the various names applied to this plant by authors, and the different localities from whence it has been obtained, some having been gathered by himself in Jamaica and Great Britain, and others by

different botanists; but we believe them all to refer to forms of the same plant, or at least to plants so closely allied that it is impossible to distinguish them; hence they can only be regarded as synonyms. The following list will show the extensive geographical range of the common Bracken over the earth's surface, and the difficulty of determining species, from a few specimens, where they are so closely allied:—

P. aquilina, Linnœus.—Great Britain, Madeira.

P. aquilina: P. latiuscula, Desvaux.

P. lanuginosa, Bory .- Ceylon.

P. lanuginosa, var. capensis.-Mauritius, Abyssinia.

P. decomposita, Presl.—Sandwich Islands.

P. caudata, Linnæus.-Mount Liban (St. Yago de Cuba).

P. caudata, Linnaus.-Jamaica.

P. recurvata, Wallich.-Nepal.

P. arachnoidea, Kaulfuss.—Rio de Janeiro, Brazil, and Trinidad.

P. esculenta, Forster.-New Holland.

NYCHIUM, Kaulfuss.—Name probably derived from onychion, a little claw; in allusion to the small spurlike divisious of the fronds.

Sori short, linear, continuous, usually becoming confluent, and covering the whole disk between the two indusia, forming as it were but one sorus on each segment. Indusium plane, linear, slightly intramarginal, the free margins of each conniving over the midrib, and opening as it were by a longitudinal suture. Veins simple, direct, free on their apices, combined by a transverse sporangiferous receptacle, which is seated in the axis of the indusium. Fronds somewhat deltoid, elongate, acuminate, decompound, from one to one and a half foot long.

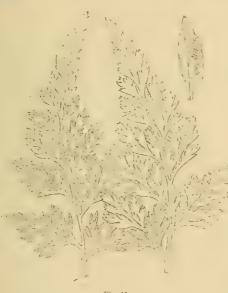


Fig. 41.

Rhizome creeping.—The three species forming this genus, of which only one is at present in cultivation, were originally placed by authors in Pteris, or Lomaria, with which they have some affinity; but on account of their very distinct habit, and the peculiar structure of the fertile fronds, they have been separated from them. They are distinguished from Pteris by the fertile segments being so narrow, that the free margins of the indusia lap over the midrib, and the sori, although in an early stage distinct, subsequently become confluent, and cover the whole disk, as in Acrostichum. From Lomaria they differ by their spore-cases being seated in the immediate axis of the indusium, similar to Pteris; whereas in Lomaria the receptacle is broad, and occupies nearly the whole space between the midrib and axis of the indusium.

Fig. 41 represents a portion of the sterile and fertile fronds, natural size, with a smaller portion of the fertile frond slightly magnified, showing the position of the sori and venation in *O. lucidum*.

1. O. lucidum, Sprengel (Leptostegia lucida, D. Don).

—A very elegant evergreen stove Fern, native of the East Indies and Nepal. Sterile frond slender, glabrous, somewhat triangular, one foot long, bright green, tri-quadripinnate; pinnules triangular; segments oblong, the apex

dentate. Fertile frond glabrous, slender, fifteen inches long; pinnae remote; pinnales triangular, segments small, linear-acuminate, and very narrow. Both forms are lateral, adherent to a creeping rhizome.

# Garden Bints for Amateurs.

JULY.

NTOWARD as the season has been for bedding out plants, and smothered as they are in many places with blight, they are, we find upon examination, progressing more favourably at the root than might have been expected. All that is required now is to take advantage of leisure moments and favourable weather to destroy insects, to inundate the plants with water, using weak liquid manure occasionally, and to keep the surface of the beds hoed after watering to prevent scorching and undue evaporation. Thus managed, the plants will progress rapidly now that the dewy nights are coming to their aid, and in a week or two our present lamentations will be changed, and we shall begin to think how splendidly the plants are growing. As, however, much of our success in flower gardening depends upon the strength of the plants planted out, no time must be lost in preparing for

another season; but the propagation of Pelargoniums, choice Verbenas, Petunias, &c., must be commenced at once, so that the plants may become strong and healthy before the dull season sets in. Attend to training the plants, so as to get the beds regularly covered, and pinch out the leading shoots of the Petunias every week. You will thus get them dwarf and strong, the beds will be thick of branches, and consequently less liable to be injured by the wind than when they are allowed to grow wildly. Where weak-growing Verbenas and other plants are blooming profusely, it will be necessary to support them with liquid manure, taking care to give the beds a good soaking. Roses, where they have been attended to, are blooming splendidly; do not forget to water, more especially the Bourbon and other autumn blooming kinds.

Among florists' flowers, Pinks will be in full beauty, and Carnations and Picotees will be coming in. Pinks are now fit for piping, and the others will be fit either to pipe or layer towards the end of the month. Attend in good time to the staking and shading of blooming plants, and above all things do not allow them to know the want of water. Heartsease are over for the present unless they are growing in a shady place, and there, if they are properly attended with water, they will remain attractive for some time to come. Ply the watering-pot to Dahlias and Hollyhocks, and recollect that manure-water is the life of Chysanthemums.

This is a good time to sow perennials of all kinds, such as Hollyhocks, Campanulas, Dianthuses, Delphiniums, &c.; for, sown now, the plants become sufficiently large, and are even more manageable than when sown at an earlier period. Propagate perennials of all kinds by cuttings or layering where necessary; remove flowers as they decay, and save seed of such kinds as are wanted.

Greenhouse plants, more especially the hard-wooded kinds, are in the open air, and those cut in last month are breaking strong. When necessary, repot them, but do not make a regular practice of shifting at this season. Some of the later blooming Pimeleas, Polygalas, Chorozemas, &c., as they go out of bloom must be cut in, and be placed in a rather shady situation until they begin to break into new growth. Young specimens in growing pits or frames must be attended to as to stopping and training, but plants intended for blooming next season must not be stopped after the end of the month. Water plentifully when necessary, using occasionally, even to the hard-wooded plants, weak liquid manure, and shifting any which require it. Pelargoniums, both of the common and fancy kinds, as they go out of bloom must be turned out of doors into the full sun, and those intended for early blooming next year must be cut down not later than the middle of the month. Should the weather prove rainy, the stools will be better under protection, as too much water after the foliage is gone, is very injurious to them. The cuttings of ordinary kinds may be put in the open ground, but the fancies will require the protection of a frame. Encourage Chrysanthemums and other plants for autumn blooming. The first named may be stopped once more to make them bushy, and those kinds growing in the open ground may be layered; for, where a quantity of dwarf plants are required, this, after all, is the least troublesome system, as they may be potted up in the autumn without sustaining any injury. Guard against insects upon plants of all kinds, and keep a look-out for mildew among Heaths.

In the Fruit Garden, the principal work will be to attend to Wall trees, thinning the young growth and nailing the other at proper distances. If insects are troublesome, employ the usual remedies; not forgetting that clean water applied in time is almost as good as anything.

In the Kitchen Garden plant out crops of all kinds, as Celery, Brocoli, Savoys, Brussels Sprouts, Cauliflower, Borecole, Cabbage, &c. Sow successional crops of Peas, Beans, &c., using early kinds at this season, and attend to watering growing crops as they require it. Sow a good breadth of Turnips towards the end of the month, prepare ground for Winter Spinach, and do not forget successional crops of Salad plants of all kinds. In ground where the Brassicas are liable to club, a good remedy is to put in a spadefull of fresh loam with each plant, as the plants will be found to succeed, and the remedy will be found less troublesome than many from time to time recommended. Do not forget a sowing of Cabbage for Coleworts early in the month, and, where such things are wanted successional crops of Early Horn Carrots and Onions.

There are various matters of routine which should be attended to at this season of the year; such as the cleaning and painting of the greenhouses and frames, the cleaning out and repairing, if necessary, of smoke flues, the examination of hot water apparatus, &c. All these, and similar matters, should be looked to now, that they may occasion no delay or inconvenience by and by.—P.





To go in linear

#### BROUGHTONIA LILACINA.

Nat. Order .- ORCHIDACE.E.

Generic Character.—Broughtonia, R. Brown—Exterior segments of the perianth (sepals, spreading, narrow, the lateral oblique at the base, coherent with the base of the labellum, and decurrent; the interior (petals) broader. Labellum undivided, ascending, coherent with the base of the column, decurrent into a linear spur adherent to the ovary. Column short, thick, dilated at the apex. Anther four-celled, the margins of the septa membranous,—Pseudo-bulbous herbs, parasitic on trees in Jamaica; leaves fleshy; scape terminal, racemose, muny-flowered.—(Endlicher Gen. Plant., 1381.)

Broughtonia Lilacina, nor. sp.—Lilae-flowered Broughtonia, —Pseudo-bulbs in groups, elongated, bearing several narrowly lanceolate, fleshy leaves; scape arising from the summit of the pseudo-bulb, slender, with one or two minute scales; flowers in a racemose head, large, delicate lilae, with purple veins; labellum obovate, slightly emarginate, with an undulated fringed margin; veined with raised lines, more marked up the centre and at the base, and the greater part of the three middle ones tinged with brownish yellow.

Syn. - Broughtonia violacea, of gardens.

pseudo-bulbs, marked above by the scars of several scales. Leaves several, elongate-lanceolate, fleshy, and sheathing at the summit of the pseudo-bulbs. From the axil of the last rises the slender purple scape, bearing at its summit a racemose crowded group of large but delicate flowers of a beautiful lilae tint, veined with purple. The flowers arise from the axils of minute triangular membranous bracts; the ovary is long and slender; the sepals lanceolate from a broad base, acuminated; the petals like the sepals in colour, but about twice as broad. The labellum rolled round the column below, and decurrent into a linear spur adherent to the ovary; its disk when laid open obovate, slightly emarginate, with undulate fringed margins; veined with raised purple lines, most strongly marked up the centre, and tinged here, from the base, with brownish yellow. Column less than half the length of the sepals, clavate, semi-terete, channelled in front, slightly incurved, the membranous margin of the upper part very narrow.

—A. H.

History, &c.—We believe this plant was found by a friend of H. Cumming, Esq., in the Island of St. Domingo, in the West Indies. It was growing on trees in a shady part of the forest, along with several other unknown Orchids, among which is undoubtedly a new Laclia. Our present subject is a very lovely plant, not less remarkable for its delicate beauty, than for the long endurance of its blossoms. The species first flowered with S. Rucker, jun., Esq., of Wandsworth; and afterwards, in May last, with Messrs. Henderson, of Pine Apple Place, in whose nursery our drawing was made. The plant from which it was made, was exhibited by Messrs. Henderson, at the May shows of the Horticultural, and Royal Botanic Societies, and the same plant, still in flower, was again produced at Chiswick, on the occasion of the June fête.

CULTURE.—This plant requires the moist heat and high temperature of the Orchid house. It should be fastened to a block of wood by means of some metallic wire, and a small portion of moss should be placed about its roots. During the season of growth it should be syringed every morning with water of the same temperature as the air of the house, and in the hottest part of summer, say during the months of June, July, and August, the syringing should be repeated in the evening. Whenever the pseudo-bulbs are fully formed, the amount of atmospheric moisture should be lessened, and the syringe used only on two or three sunny mornings during the week. Towards the beginning of October, even that may be dispensed with entirely, and a dry cool atmosphere allowed to prevail; this is to induce a state of rest, which is just as necessary to a native of St. Domingo as it is to an inhabitant of the woods and dales of this country. The excitement of keeping the plants constantly growing, weakens their powers, so that instead of progressing they lose their energy, and eventually perish. A season of growth and a season of rest is, therefore, necessary. The heat, when the growth is going on, should be about 75° by day, and 65° by night. When it is completed, the heat should be 60° by day, and 50° by night. The plant is increased by dividing some of the oldest pseudobulbs from the rest, placing them upon fresh blocks, and treating them in every respect like established plants.—A.

# THE METROPOLITAN JUNE EXHIBITIONS.

AftHIS has been a busy month, and exhibitions teemed so rapidly upon us that our note book is more than full. To give, however, a full detailed account of each gathering would be to fill our pages with this one subject; we must, therefore, rest satisfied with "culling," in reality, "a few flowers" from each collection, and noting other things which may rank more as curiosities. To add another charm to the floral wreath of June, the American Exhibitions at the Regent's Park Garden, and likewise at Chiswick, have lent their aid, and what with the gay flowers in the tents and the American plants, such June exhibitions were never before seen. The American plants at Chiswick were supplied entirely by Mr. Hosea Waterer, of Knap Hill, whose resources in that way are known to be almost boundless, and well has he performed his task, for some of the plants are not only matchless as to size, but they are profusely rich in blossom, and the colour of the same character. The arrangement which is in the New Rock Garden, though pretty, is not effective; it is frittered too much into parts, and in no one place can you get an expansive or enlarged view of the whole, indeed it reminds one of the old nursery story:—

"The banks are so steep, and the walks are so narrow, One can scarcely get along with a wheelbarrow."

The awning which covers this garden is of the most paltry description, and, after the exhibition, on June 7th, was blown down, doing considerable injury to the plants. It was erected upon the "penny wise and pound foolish" plan. We learn, however, from the Gardener's Chronicle, that the fault rests entirely with the late Secretary, and if such is the case, it is a fortunate thing he has been removed.

At the Regent's Park the contributors to the exhibition are the Bagshot Nurserymen, Mr. John Waterer, Messrs. Standish and Noble, and Mr. Baker, and as each has brought a quantity of his own seedlings, of course there is more variety, and the tout ensemble is consequently more imposing. The arrangement has been slightly altered since last year, and we think improved, for though the boundary is more distinctly marked, a breadth of feature has been imparted which is very desirable and imposing. In these days of scenic effects and panoramic views, how far might the scene-painter's art be brought to act upon the sides of the tents? and what would be the effect of either of these exhibitions illuminated by night? In colour, the American plants are right for artificial light, and we imagine "a feast of flowers" as well as lanterns, would be an imposing and attractive sight. The other night we saw, in the Royal Gardens, Vauxhall, a slight sample of an illuminated exhibition, which was so effective that we should like to see one upon a larger scale. The colours of some of the high-coloured flowers, as Pelargoniums, Heaths, Clerodendrons, were very rich, but the yellows were as might have been expected, very poor. It is possible that by using coloured lights, each plant might be made to assert its own influence. We believe it is the intention of the proprietor to try the experiment of a night exhibition, and if only for the purpose of rendering flowers still more attractive, we wish them every success.

To return to the legitimate exhibitions, doubtless the most remarkable and interesting, because an unusual feature, was the magnificent collection of Pitcher plants, Nepenthes, and Sarracenias, from the nursery of Messrs. Veitch & Son of Exeter. These plants varied in height, from the close-growing Cephalotus follicularis, like a nest of young birds, to some of the specimens of Nepenthes Rafflesiana, which were six feet high, and bearing at the extremity of each leaf a pitcher, which would hold nearly a pint of fluid. Among the thirty-two plants produced, we noticed the following, N. Phyllamphora, sanguinea, ampullacea, and a variety, lævis and distillatoria; Sarracenia variolaris, flava, Drummondii, purpurea, and a new species. The effect of this group was really most imposing, and was the observed of all observers, not only as being a new feature, but also as exemplifying very superior management. It also gives us a foretaste of what may be expected from collections of plants artistically arranged, for we feel convinced the time is coming when the monotony of the present formal arrangements must be broken up and diversified, and when plants remarkable for their foliage and elegance of growth will be brought into competition. Such plants as low-growing Palms, Musas, Ferns of all kinds, Orchids, Crotons, Dracenas, Hedychiums, Ingas, Astrapæas, Browneas, and perhaps even the Amherstia itself, with hundreds of other plants which might be named, not forgetting the Musas and Cacti, would form a group with which all would be pleased, and which would impart an entirely new feature to the exhibitions. At the present time, to those who, like ourselves, have served several apprenticeships in these matters some change is needed, for grand and matchless as the various collections and individual specimens are, there is too much sameness in their appearance, and the want of variety is becoming yearly more manifest. Take, for example, Mrs. Lawrence's or

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Mr. Colyer's collection of plants, Mr. Rucker's collection of Orchids, or Mr. Quilter's Heaths, and if you examine all the collections below them, they will be found to contain nearly the same kinds; indeed, the smaller collections are mere repetitions of the larger ones, and we know so well the principal plants which each exhibitor will produce that we would undertake to write now a report of the July meetings, and not commit half-a-dozen mistakes. It is therefore indispensable that new blood be infused into the collections. The "Fancies" have added attractiveness to the Pelargonium tents. The Pitcher plants were new. Along with Orchids, Ferns and Mosses are always lovely, but more so when artistically arranged; and we feel quite certain that arrangements of plants remarkable for the beauty of their foliage, if properly carried out, would be much appreciated, and would exercise considerable influence in elevating the taste of those brought in contact with them. Designs for Orchid stands are represented at p. 196-7 of our first volume, and others equally appropriate would soon be produced if there was a demand for them. While on the subject of the fitness of things, we cannot but reiterate our remarks of last year relative to the Pot Roses; for much as we may admire them in May, and poetical as a "Rose in June" may sound, we must confess we cannot admire the formless, colourless, mop-like things produced in June. Pot Roses are admirable for May, but in June, when brought into competition with those flowers grown in the open ground, they lose much by the contrast, and sink into comparative insignificance. We therefore again repeat, give prizes sufficiently remunerative to bring the Rose-growers out in their full strength in May, but do not put art against nature in June. Roses, to see them in perfection, must be visited early, when the dew is fresh upon them; but taken in the day, more especially if it is a warm one, the petals become reflexed, the colour flies, and the flower, which was lovely with the dew-drop, becomes commonplace under the effects of a meridian sun. Hence the impossibility of producing Pot Roses in perfection later than May.

Among plants the miscellaneous collections were remarkably rich, and it is quite certain that such a group as that produced by Mr. May, Mrs. Lawrence's gardener, was never before seen. Each plant was perfect, and some of them of remarkable and symmetrical proportions. The large plant of Pimelea spectabilis was in glorious condition, being a sheet of bloom, and a specimen of P. Hendersonii was not less remarkable. Of Polygala acuminata a prodigious plant was produced, and exquisitely beautiful plants of Leschenaultia biloba major (Hunt's variety), formosa; Chorozema Henchmanni; Dipladenia crassinoda-finely coloured; Ixora coccinea and javanica; and several fine Heaths and Azaleas. Mr. Cole had some splendid plants, especially of Polygala cordifolia, Aphelexis, Heaths, Azalea Gladstanesii, Dipladenia splendens—with magnificent flowers, Allamandas, Stephanotises, and Ixoras. These plants were in splendid condition, and could only have been placed second where the overwhelming strength of Mrs. Lawrence was brought against them. Messrs. Fraser produced a very promising group, giving evidence that they intend before long to again occupy their former position. In the smaller groups, those from Mr. Green, Mr. Taylor, Mr. Speed, and Mr. Croxford, were the most remarkable. Mr. Green's plants were, as they always are, bloomed to the day and magnificently coloured. Mr. Taylor produced a lovely plant of Stephanotis floribunda, which was a complete sheet of waxy flowers, and Mr. Speed had some admirable Clerodendrons.

Of the Orchids, as viewed en masse, it would be impossible to speak too highly: for, whether judged for their gorgeous appearance or for their necessarily more artistic arrangement, there was a freshness and beauty about them which must always please. From Mr. Rucker's garden, Odontoglossum citrosmum was again produced in remarkable beauty, and richer in colour than it was when we figured it last year. We also noticed Vanda suavis, Camarotis purpurea, a grand plant; Phalamepsis grandiflora; Anguloa uniflora, with scores of flowers; the rare Dendrobium Dalhousianum; Saccolabium ampullaceum, Odontoglossum niveum, and a great variety of commoner things. Mr. Schroder produced Dendrobium Devonianum, one of the most lovely of Orchids, Schomburgkia tibicina, Vanda cristata, and a noble plant of Phalamopsis grandiflora. Other remarkable Orchids were Cypripedium barbatum, Acineta Humboldtii, Odon oglossum hastilabium, Cattleya Aclandiae, Acrides odoratum, Cwlogyne Lowii, Ansellia africana, and Vanda Roxburghii. Mr. Cole sent a noble specimen of Dendrobium chrysanthum.

Among single specimens, perhaps the most remarkable plants were Erica metulæflora from Messrs. Veitch; Leschenaultea formosa from Mr. Williams and Mr. Cole; L. biloba major from Mr. May; and Clerodendron fallax magnificently done from Mr. Speed of Edmonton. Mr. Edwards of Chiswick House, sent a fine standard specimen of Rhododendron aureum, which was much admired.

Of new plants, Messrs. Veitch had a smooth leaved shrubby Calecolaria from Peru, a rather promising subject for the hybridizer; Cantua dependens, noticed some time back; Dendrobium Veitchianum, more remarkable for its singularity than beauty, being of a pale lemon-green colour, with a striped lip; Eucalyptus coccifera, a plant likely to prove hardy in many places near the coast;

Bolbophyllum Lobbii; and a species of Eurybia, a dwarf inconspicuous but very fragrant shrub. Messrs. Henderson sent Gastrolobium cuneatum, a promising plant, and G. intermedium [?] with scarlet flowers. Mr. Franklin sent a species of Acineta, and Mr. Mylam had a Saccolabium with short spikes of white flowers with rose-coloured lip.

The Pelargonium tent was a grand sight, and perhaps such a quantity was never before staged. Mr. Turner was again first in the new class with some remarkably neat plants, and his small dwarf Fancies were exquisitely neat and lovely. Fancies were also beautifully shown by Mr. Robinson and Mr. Cock. Seedlings were not less numerous than remarkable, and the following may be considered as an official report of the prizes both by the Pelargonium Fund and the Society—we speak of the Regent's Park only, the Horticultural Society having ceased to reward seedling flowers for several

years past:-

The prizes offered by the "Seedling Pelargonium Fund" were contested for on this occasion, on which the following raisers were contributors, and many varieties were represented by two, three, and four plants: From Mr. Beck were Incomparable, Gem, Arethusa, Ambassador, Painter Improved, Cardinal, and Exhibitor; from Mr. Story, Purity; from Mr. Hocken, Nightshade and Honeybell; from Major Foquett, Annette and Agatha; from Mr. White, Charming May and Martile; from Mr. Bragg, Jullien; from Mr. Turner, Flying Dutchman, Vivid, Supreme, Little Nell, Proteus, Breba, Cynthia, Sheet Anchor, and Illuminator; from Mr. Foster, Scarlet Eclipse, Shylock, Lablache, Optimum, Purple Standard, Rubens, Ariadne, Eurydice, Enchantress, Pulchrum, Lavinia, Melissa, and Pansy; from Mr. Hoyle, Beatrice, Elise, Herald, Magnet, Ganymede, Remus, Chieftain, Azim, Colonel of the Buffs, and Van Tromp. The Censors, Messrs. Riley, Stains, Veitch, and Robinson, furnished the following award: First Prize, Magnet (Hoyle); second do., Purple Standard (Foster); third do., Elise (Hoyle); fourth do., Ganymede (Hoyle); fifth do., Scarlet Eclipse (Foster); sixth do., Arethusa (Beck); seventh do., Herald (Hoyle).

Seedling Fancy Pelargoniums were shown in classes, the division of colours being—class A., light flowers, not darker than Modestum; class B, rose flowers, not darker than Minerva; class C, crimson flowers, not darker than Fairy Queen; class D, dark, not lighter than Hero of Surrey; class E, dark self, not lighter than Defiance: in these classes thirty-four varieties were shown. The censors made the following award—class A, none worthy; class B, Mirandum (Ayres), a second prize; class C, Formosissimum (Ayres), a first prize; Perpetuum (Ambrose), a second prize; Triumphant (Ambrose), a third prize; class D, Superbum (Ambrose), a first prize; Richard Cobden (Ambrose), a second prize; Caliban (Ayres), a second prize (equal); Gipsey Queen (Ayres), a third prize; class E, Captivation

(Ambrose), a first prize; Advancer (Ayres), a second prize.

The Society's certificates were awarded to Ariadne (Foster), and Elise (Hoyle). A small silver medal was awarded to Magnet (Hoyle), for an exhibition of four plants; the same variety receiving the Society's certificate at the previous exhibition.

In Fancy Pelargoniums, Superbum (Ambrose), Captivation (Ambrose), and Advancer (Ayres), were

selected by the Society's censors for certificates.

The exhibition of Fruit in both gardens was, for this dull season, very fine; it may be true the white Grapes were not so ripe as they ought to have been, and that the black ones were not finer than we had previously seen, still they were such as cannot be seen in any other country in the world. We regret we have not space for a detailed account, but we must not omit to state that Mr. Ivison, gardener to the Dowager Duchess of Northumberland, sent fruiting plants of Nutmeg, Gamboge, and Vanilla; also a Cinnamon tree in flower, with dry Cinnamon produced at Syon.—A.

# THE PALMYRA PALM.

THE Palms are truly the princes of the vegetable kingdom. As a race, they are remarkable not a less for the majestic aspect of their towering stems, crowned with gigantic foliage, and for the grandeur which they impart to the scenery in which they occur, than for their economical importance to mankind. Wine, oil, wax, flour, salt, thread, utensils, weapons, and habitations are among the most important of their products.

The Palmyra Palm, Borassus flabelliformis of botanists, is one of the most noble of its race, and also yields many useful products to the inhabitants of those countries in which it occurs. It is one of the few species which are widely dispersed, being found all over India, both on the continent and in the islands, extending as far as 30° of north latitude. It forms a tree, with a trunk thirty to forty feet high, tapering upwards, and terminated by a great crown of fan-shaped leaves, which measure

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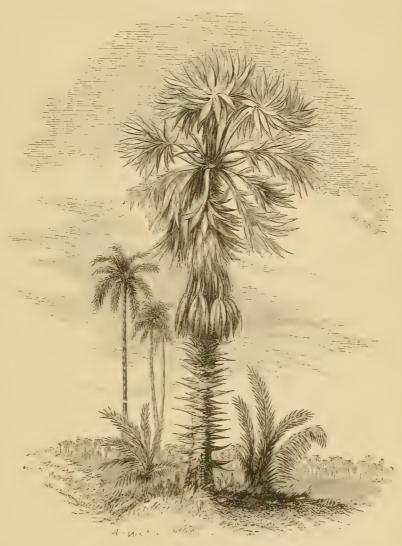
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about four feet in length, and are attached by spiny-edged stalks of about equal length; the leaves are plaited like a fan, and divided into from seventy to eighty rays. The trunk has a very singular checked appearance, closely resembling the back-bone of a large fish, caused by the stalks of the old leaves adhering to it after the leaves themselves have decayed. As in all Palms, the flowers are small and numerous, and issue from spathes which are seated in the axils of the mature leaves; these

flowers are dicecious, and the females are succeeded by a three-seeded three-cornered drupe, about as large as a child's head, consisting of a thick fibrous succulent brownish rind, and containing three seeds of the size of a gooseegg. The substance of the young seeds is cool, sweet, and refreshing, but becomes hard and uneatable when ripe. The fruit is soft, emits a fragrant smell, and its pulpy matter is made into cakes, and dried in the sun.

The Palmyra is moreover one of the principal sources of palm wine, which is the sap drawn from the more succulent parts. The Cocoa-nut tree (Cocos nucifera) and the Gomuto (Suquerus saccharifer) also yield this saccharine sap abundantly. It is obobtained by crushing the young inflorescence, cutting off the upper part,



THE PALMYRA PALM.

and attaching a vessel to the lower cut end. The vessel gradually fills, and is removed every morning, a fresh slice being removed daily from the cut end, until the whole is sliced away. The fresh sap, taree or toddy, is very pleasant and refreshing; but if fermented, it becomes one of the most intoxicating liquors of tropical countries. The sap also yields, on evaporation, a coarse sugar, called jaggery; and, remarks Van Rheede, it would be happy if it were always applied to so innocent a purpose.

The outer portions of the old stems of the Borassus form a very hard brown timber, which takes a fine polish, and is much used. The younger parts are useless as timber. The leaves are employed as thatch, as umbrellas, as fans, and also for writing on, the instrument used for this purpose being a piece of sharp-pointed metal, called a stylus. This palm is a tropical plant, requiring for its cultivation a very high temperature, and good loamy soil.

# ON THE ELEVATED TEMPERATURE OF THE MALE INFLORESCENCE OF CYCADEOUS PLANTS.\*

By Dr. DE VRIESE, PROFESSOR OF BOTANY IN THE UNIVERSITY OF LEYDEN.

M LL living bodies have a temperature peculiar to themselves; that is to say, they have a temperature, All different from and independent of those which surround them. This temperature is intimately connected with their nature, and is modified according to the nature of the different conditions in which they may be.

This necessary consequence of the successive changes which organic matter undergoes during life, is in its turn one of the causes which preserve organised bodies, and by which animal and vegetable life are protected from destruction or dissolution, which external circumstances would not be long in producing. It is this peculiar temperature which permits animals to inhabit regions of the globe that, on account of their cold, would be uninhabitable; which allows the development of aquatic vegetables in frozen water; which defends trees against winter; and which, in tropical regions,

causes vegetables to withstand a temperature often too high for their organisation.

The observations upon the elevated temperature in the flowers of Aroideous plants in general, have shown that this phenomenon takes place in a high degree, and originates in a sort of combustion, that is to say, an absorption of oxygen and emission of carbonic acid. Very recently a high degree of temperature has been observed in a plant belonging to a family in which that phenomenon has not been noticed before. Mr. Teysman, chief gardener at Burtenzorg (in Java) in 1845, has informed me that he has observed an elevated temperature, and at the same time a very strong smell, in the male cone of Cycas circinalis. I received from him, in October 1849, and November 1850, seven series of observations, made in the aforesaid garden upon male flowers of this plant. What is most remarkable in these observations is connected with the following facts:—The elevation of the temperature always takes place between six and ten o'clock in the evening. Messrs. Bory (at the Isle of France) and Hasskarl (at Java) have observed the maximum at six o'clock in the morning; De Saussure observed it in the Arum italicum between four and seven in the evening; and the Colocasia odorata, in the gardens of Paris, Amsterdam, and Leyden, has always attained its maximum at noon. This periodical production of heat differing in different climates, and in flowers of different families, has not yet been accounted for. It appears from the inspection of the tables of several hundreds of observations, that the maximum has varied between 9° and 14° Cent., and the difference has been 3.75-4.50°.

It is acknowledged that in general, the coloured parts among the appendicular organs, in vegetables have an absorption and exhalation contrary to those of green plants. The oxygen is absorbed, carbonic acid is exhaled. Both take place in organs where the elevated temperature is shown in a high degree. It is proved that this phenomenon is constantly preceded and accompanied by rapid growth in the flower. Nothing prevents us from admitting that the same action actually takes place in the male cone of Cycas, where the rapid development of pollen, or the formation of cells which compose it, should surpass all that has been observed in this respect in the vegetable kingdom. shall endeavour to prove it by the following calculations:--The male cone, of which I have given the description elsewhere, is (in metres) 0.450 long, and 0.200 broad. The sum of the external surface is difficult to estimate, on account of the irregular form of the organ, but it cannot be considerable. In calculating the number of scales at 3500, and the surface of each of them at four square centimetres, the whole sum of the organs which compose the cone should be equal to 14,000 square centimetres. The surface of the scales at the under-side is covered with unilocular anthers almost contiguous, and the number of these anthers may be calculated at 400. Thus the total number of these anthers might be calculated at 1,400,000. Each anther contains several thousands of granules of pollen, which in a very short space of time undergo, in their cavities, all the necessary organic, physical, and chemical changes.

It is easy to admit that the alternate absorption and emission of gas, in so rapid a process, must play an important part. The whole leads us to believe that in cases where there is so great an analogy in the functions (as in the flowers of Aroideous and Cycadeous plants), the same agents should regulate and preside over the phenomena of life, of which all that modern science has been able to discover, as to its mode of action, belongs to physics and chemistry.

\* From Hooker's Journal of Botany.

#### THE HORTICULTURAL SOCIETY.

June 17 .- Mr. May, gardener to E. Goodhart, Esq., Langley Park, Beckenham, Kent, sent a beautiful purple and white striped Phlox, called Mayii variegata; it is one of the prettiest we have seen of the many seedlings obtained from Phlox Drummondii crossed with other kinds; and, if constant, will no doubt be an acquisition. Mr. Mackintosh, nurseryman, Maida Vale, Edgeware Road, furnished a small example of a white Chrysanthemum in blossom, in order to prove that this favourite autumnal flower may be made to bloom in the middle of summer; it was raised from a cutting put in in December last, and had been grown on a greenhouse shelf near the glass. Mr. Chapman, gardener to J. B. Glegg, Esq., was awarded a Knightian medal for beautifully ripened Grosse Mignonne Peaches and scarlet Nectarines; and two dozen finely swelled and highly coloured Elruge Nectarines, which received a Banksian Medal, were produced by Mr. Tillyard, gardener to Lord Southampton, at Whittlebury. Mr. Cuthill, of Camberwell, obtained a certificate of merit for very fine fruit from the open ground, of his Black Prince Strawberry, a useful sort, now becoming pretty well known. It is certainly the earliest and most prolific of Strawberries, yielding as it does a constant and plentiful supply of good fruit from this season up to the very latest period at which Strawberries can be gathered out of doors. A singular circumstance connected with this variety is, that blossoms have been detected on some of the plants exhibiting a beautiful crimson colour. Melons came from Mr. Chapman, and Mr. Eckford, gardener to C. Child, Esq. The former sent two oblong fruit of the Sweet Melon of Cashmere, a white-fleshed sort of which little is at present known; it is, however, evidently related to the Persian kinds and looked as if it would be very good. Mr. Eckford had two fruit of the Bromham Hall, one not externally different from it, named Brown's Green-fleshed, and two of the Trentham Hybrid. It may be worthy of remark that the Bromham Hall, which last year bore away first prizes at all the great flower-shows, has this year as yet proved little more than third-rate. From the garden of the society came the scarce Brassavola Digbyana, with a broadfringed lip; Cyrtochilum stellatum, having bright green healthy leaves, a rare occurrence with this plant; Cyrtoceras reflexum, Franciscea Hopeana, a profusely-flowered medium-sized bush of Pimelea decussata; Dillwynia clavata, one of the handsomest of the genus; an Epacris; two Cape Heaths; eight varieties of Achimenes; an Everlasting; and the Chinese Indigo plant, Isatis indigotica.

### THE NATIONAL FLORICULTURAL SOCIETY.

June 12.—There was a good display of Seedling Pelargoniums on this occasion. A first-class certificate was awarded to Elise, a large flower, with pink under-petals, and white eye, upper petals maroon, edged with delicate pink. A similar award was made to Ganymede, a distinct nice-looking flower with delicate pink under-petals, shaded with lilac, upper petals dark, narrowly edged with lilac. Also to Magnet, on account of its fine colour and profusion of bloom. The above came from Mr. Hoyle, of Reading. Mr. Beck, of Isleworth, received a certificate for Arethusa, a nice variety, with maroon top, very delicate salmon under-petals and a light eye. Incomparable, from the same raiser, was commended for fine colour. Purple Standard, from Mr. Foster, of Clewer, received a certificate; and so did the same grower's Enchantress and Ariadne, both highly desirable sorts, more especially the latter. Mr. Ayres, of Blackheath, was awarded a first-class certificate for a Fancy Pelargonium, named Advancer, a well-shaped very desirable flower, and certificates for Caliban, Miranda, and Gipsy Queen, which were pleasingly-marked nice varieties. Beauty of St. John's Wood, from Mr. E. G. Henderson, was commended for its colour; but in its present state it is too small. The same nurseryman's Queen of the Fancies was commended for fine form and general promising appearance. Dr. Maclean had a seedling Pink called Mrs. Maclean, which was considered promising. Some Calcolarias were shown; but none were considered worth rewarding; a shrubby yellow-flowered bedding kind, from Messrs. Wood and Ingram, of Huntingdon, was very showy; but it was loose in habit; Wellington Hero (bright yellow), from Mr. E. G. Henderson, was commended for bright colour. Mr. Turner, of Slough, had the beautiful seedling Pansies named National, Blanche, Swansdown, and Eupnemia, and five Pelargoniums. Messrs. Henderson sent a nice light Fuchsia.

# GARDENERS' BENEVOLENT SOCIETY.

The anniversary dinner of this excellent institution took place on June 9th, Mr. Paxton officiating as chairman, supported by Mr. Chadwick, Dr. Hammel of St. Petersburg, Mr. Charles Dickens, Douglas Jerrold, many of the clite of the literary world, and upwards of one hundred and twenty nurserymen and gardeners from all parts of the country. The speeches delivered during the evening

were such as might be expected from the names enumerated; and our friend Mr. Spencer, of Bowood, in responding to the toast of "The Horticulturists," acquitted himself with great brilliancy and eclat. Donations and subscriptions to the amount of upwards of £300 were announced during the evening; and we have now the pleasure to add that a donation of £50 has since been made by the Queen and Prince Albert, and that her Majesty has graciously condescended to become Patroness of the Society. We now hope that gardeners in all parts of the country will aid the good work; for, connected as they necessarily are with the wealth and luxuries of the country, it is their fault if this institution is second to any in existence. We, as a gardener, have never appealed in vain; and we believe that every employer of a gardener would support the institution, if its claims were properly represented to him.

# New and Rare Plants.

SMILACINA AMENA, Wendland. Pretty Smilacina (Paxt. Fl. Gard., ii., 24).—Nat. Ord., Liliaceæ § Asparageæ.—A rather weedy stove perennial, with thick knobby roots, and growing three or four feet high, bearing long narrowish dull green ribbed leaves, shining above and glaucous beneath; and compound panicles of small white flowers. From Guatemala. Introduced to the German Gardens.

Lycaste Leucantha, Klotzsch. White-flowered Lycaste (Paxt. Fl. Gard., ii., 37).—Nat. Ord., Orchidaceæ § Vandeæ-Maxillaridæ.—A pretty dwarf growing epiphyte, allied to L. plana. The flowers have oblong wavy sepals rolled back at the point; smaller petals of the same form, but while young rolled together at the base into a kind of short tube, and a slightly three-lobed concave lip, slightly hairy on the upper side. There are different varieties in cultivation with larger or smaller flowers, some having them white, others more or less stained with blood-red. From Central America. Introduced by Mr. Warczewitz in 1849. Flowers in spring and summer.

Mormodes Atropurpurea, Hooker. Black purple Mormodes (Bot. Mag., t. 4577).—Nat. Ord., Orchidaccæ. § Vandeæ-Catasetidæ.—A very pretty stove epiphyte, with clustered oblong pseudo-bulbs, sheathed by large membranous pale-coloured scales. The flowers are rather distant pendulous, on a scape a foot high; the sepals and petals ovate-lanecolate, dark purple, as is the broadly obcordate revolute lip, except at the parts about the base of the column, which are yellowish; the lip is velvety, with short hairs. From Panama. Introduced in 1849 by M. Warczewitz. Flowers in January. J. D. Llewellyn, Esq., Penllergare.

Epidendrum aciculare, Bateman. Needle-leaved Epidendrum (Bot. Mag., t. 4572).—Nat. Ord., Orchidacee § Epidendreæ-Læliadæ.—Syn., E. linearifolium, Hooker.—A small and graceful stove epiphyte, having clustered ovate pseudo-bulbs, each producing two long narrow keeled linear leaves, and a scape of about a foot in height, bearing a lax panicle of about a dozen pretty flowers. The narrow spreading sepals and petals are of a purplish brown, tipped with yellowish-green; the lip has a prominent, roundish, central lobe, which is white, veined with purple, contrasting with the deep colour of the sepals. Probably from Mexico. Introduced some years since, and sent to the Royal Garden, Kew, with the collection of the late Mr. Clowes. Flowers in June.

EPIDENDRUM QUADRATUM, Klotzsch. Quadrate Epidendrum (Paxt. Fl. Gard., ii., 46).—Nat. Ord., Orchidaceæ § Epidendreæ-Læliadæ.—A stove epiphyte, apparently very near E. varicosum, but with much narrower leaves. The flowers are brownish-green, with a dirty white lip, dotted with red. From Central America. Introduced to the German Gardens.

PITCAIRNIA FULGENS, Decaisne. Fulgent Pitcairnia (Paxt. Fl. Gard., ii., 46.)—Nat. Ord., Bromeliaceæ.—A showy stove herbaceous plant, with long narrow leaves, spiny at the base, and mealy beneath. The flowers are in a close raceme, enclosed in great pale green smooth bracts, longer than the calyx; the petals are straight, two inches long, rich scarlet. From Guadaloupe. Introduced to the French Gardens by M. Linden.

Wallichia densifiora, Martius. Dense-flowered Wallichia (Bot. Mag., t., 4584).—Nat. Ord., Palmaceæ § Areceæ.—Syn., W. oblongifolia, Griffith.—A very elegant palm, and very beautiful when in fructification. It is a dwarf or stemless species; it has (comparatively) small pinnate fronds, with linear-oblong pinnæ, which are whitish beneath. The male and female spadices appear on the same plant, and arise from among a tuft of strong coarse fibres; the former enveloped in large imbricated spathes of a dark purple streaked with yellow; these separate, and then a dense cluster of male spadices appear of a nearly white colour. The female spadix is a compound spike, with violet-coloured ovaries. Such a plant is well suited to commemorate Dr. Wallich's labours in the field of science. From Assam and the damp forests at the foot of the Eastern Himalaya, extending at least as far west as Kamaon, where Dr. Thomson found it at an elevation of about two thousand feet above the level of the sea. Introduced some years since to the Royal Garden, at Kew.

Ixora Javanica, De Candolle. Javanese Ixora. (Bot. Mag., t. 4586).—Nat. Ord., Cichonaceæ § Coffeæ.—Syn., Pavetta javanica, Blune; not Ixora javanica of Paxton's Mag. Bot.—A fine evergreen stove shrub, with the branches—the younger ones at least—of a rich coral colour. The leaves are ovate-oblong acute, scarcely coriaceous. The flowers grow in large terminal corymbs, on a long peduncle; and have a slender filiform red tube, an inch and a half long, and a rim, an inch across, deep orange-red, the roundish lobes lying horizontally patent. From Java. Introduced in 1850. Flowers in spring. Messrs. Rollisson, of Tooting.

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Evallonia rusirandha

#### ESCALLONIA MACRANTHA.

Nat. Order.—Saxifragaceæ & Escallonie.e.

Generic Character.—Escallonia, Mutis.—Calyx with a hemispherical tube adherent to the ovary; limb superior, five-toothed or five-parted. Corolla of five petals inserted on the margin of an epigynous disk, oblong-spathulate, the claws erect, the limbs obtuse and spreading. Stamens five, inserted with the petals; filaments thread-like; anthers ovate-oblong, two-celled. Ovary inferior, with a cushion-like or cup-shaped epigynous disk, two- or more rarely three-celled; placentas adherent to the middle of the dissepiments or to the central angles of the cells, with many ovules; style simple; stigma sub-peltately dilated, with two or three notches. Capsule crowned by the tube of the calyx and the epigynous disk, two- or three-celled, septicidally two- or three-valved from the base; valves coherent at the apex; placental column thread-like, free. Seeds

numerous, with a pitted testa. Embryo orthotropous, subcylindrical, short, in the axis of fleshy abbumen.—Trees and shrubs growing in the tropical part of South America and beyond the tropics in the south; most frequently resinous; leaves alternate, entire, or sharply serrate, without stipules; flowers terminal or more rarely axillary, solitary, paniculate, or racemose, white rose-coloured or purple.—(Endlicher Gen. Plant. 4674.)

ESCALLONIA MACRANTHA, Hooker and Arnott.—Large redflowered Escallonia.—Branches glandular-pubescent; leaves obovate-elliptic, somewhat obtuse, wedge-shaped at the base, serrated, reticulated, glabrous, dotted with resinous points beneath; panicles terminal, with deciduous bracteoles; calyces glandular-pilose, the teeth subulate.

feet high. The branches terete, clothed while young with glandular hairs. Leaves obovate-elliptical, somewhat blunt-pointed, and tapering to the base, alternate, doubly serrated; the upper surface smooth, dark shining green, marked with depressed reticulations, the under surface paler coloured and dotted with resinous points. Flowers in terminal panieles, large, deep red, on bracteolated pedicels, the bracteoles deciduous. Calyx turbinate, clothed with stalked viscid glands, the lower portion of the tube adherent to the ovary, the upper part free, bell-shaped, and divided about half-way down into five slightly-spreading awl-shaped teeth. Corolla of five spathulate petals, the erect claws of which form a tube five-eighths of an inch long, and the spreading laminæ a limb of fully three-fourths of an inch across. Stamens as long as the tube. Ovary two-celled; the style columnar, surrounded at the base by a large furrowed gland, and tipped by the thick dilated obscurely two-lobed stigma. Capsule turbinate-cylindrical, surmounted by the persistent limb of the calyx.

History, &c.—A fine hardy evergreen shrub imported by Messrs. Veitch of Exeter, from Chiloc, through their collector, Mr. W. Lobb. It was produced by them a year or two since at the metropolitan exhibitions, and about the same time figured by Sir W. J. Hooker, in the Botanical Magazine. No garden where ornamental plants are esteemed ought to be without this Escallonia, which blooms from June onwards for a considerable period. Its blossoms are rich crimson red, and are rendered more attractive by contrast with the background of deep green glossy foliage. Our figure was made from specimens communicated last June by Messrs. Veitch, who have this year exhibited the plant with deeper coloured flowers than on former occasions.

CULTURE.—The species of this genus are all free-growing plants, in any moderately good soil. E. macrantha is found to be hardy in the climate of Devonshire, but it will probably, in less favoured localities, require the protection afforded by a wall, and a dryish situation; and, even then, will need some slight covering to enable it to withstand our severer winters. In a cold conservatory it would, no doubt, form a splendid bush, planted out in a bed of good peat and loam; and moderate sized plants grown in pots would be found very useful for purposes of decoration. It may be multiplied to any extent by cuttings of the young shoots planted under hand-glasses in sandy soil; the young plants requiring the protection of a frame in winter.—M.

# THE CHEMISTRY OF SOILS AND MANURES.

By Dr. A. VOELCKER, Professor of Chemistry in the Royal Agricultural College, Cirencester.

On the formation of soils—mechanical causes.

MITE now come to notice another class of agencies of a different nature to those to which we have before adverted:—

II. Mechanical causes active in the formation of soils.—Generally the first stage in the disintegration of rocks can be referred to a chemical force. The described chemical agencies, however, are often associated with mechanical ones or followed by purely mechanical causes, which produce great changes in the appearance of rocks, and contribute much to the rapid formation and the peculiarity of some soils.

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1. One purely mechanical agency in the formation of soils is the force of gravitation. In the case of overhanging or steep precipitous rocks, when one or all of the chemical causes already mentioned have acted long enough to weaken the cohesive force which keeps the mass in its position, so that the force of gravity preponderates over that force, the part so influenced tumbles down in obedience to the law of gravitation, and contributes to fill up the valley below with the disintegrated fragments. The stony masses, in their passage downwards, are reduced to smaller pieces, small fragments and light powder all aggregated together. According to the nature of the rock, vegetation springs up on these debris more or less luxuriantly, often very rapidly. When visiting, some years ago, the scene of the fall of the Rossberg on the village of Goldau, near the Rigi, in Switzerland, which took place in 1806, I found the greater part of the debris covered over with a luxuriant vegetation.

2. The fine powder resulting from the disintegration of rocks, and fine sand, are easily moved by heavy winds, when they are found covering the ground in unsheltered places. Heavy winds contribute much in changing the aspect of some localities, particularly those near the sea-coasts. On the shores of the Baltic large tracts of arable soil are annually covered with drift-sand. On the southwest coast of France the dunes increase every year about seventy feet in breadth. The effects of the wind on the largest scale are exhibited in the deserts of Africa; many of the colossal antiquities of

Egypt are almost completely covered with sand.

3. Water, which acts, as we have seen, chemically in dissolving some of the constituents of rocks more readily than others, exercises likewise a most powerful influence in changing the nature of rocks in a purely mechanical way, thus contributing to the formation of new soils. The rain-water which is absorbed by different rocks freezes in winter, and expanding in becoming ice, bursts the rock into many fragments more thoroughly than almost any other mechanical contrivance, in the same way as we see a good winter frost after a fall of rain, pulverising the soil better than any clod-crusher can do. Further, a powerful influence which water exercises in breaking up rock masses and degrading eminences to lower levels, is due to what is called the hydrostatic paradox. Any one who is at all acquainted with the laws of hydrostatics will at once admit this as a most powerful disintegrating force. Again, the rains continually wash off the fine particles from the decomposed higher rocks, and carry them down to lower levels; and on occasions of great floods not only the finer particles, but gravel, larger fragments of minerals, and even heavy stones are transported to great distances, and distributed often in large quantities over extensive districts of a country. Brooks and rivers carry along with them marks of the country through which they flow. In the stages of their movement the coarser materials are first deposited, the finer particles and mud move along with the stream, and are finally deposited more or less completely at the mouth of the rivers, where the flow of the waters gradually becomes slower at periods of comparative rest. These deposits form the alluvial soils of our river banks. The vast mass of materials deposited at the mouth of large rivers, such as the Mississippi, the Indus, the Amazon, the Rhine, alters the condition of the soils along the banks of the deltas of these rivers from a naturally sterile into a most rich and fertile one.

The quantity of matter which a river thus brings down varies with the length of its course, the velocity of its current, and the nature of the rocky beds through which it passes in its course towards the sea. According to Mr. Horner, a thousand gallons of the waters of the Rhine near Bonn hold in suspension two-thirds of a pound of mud, which for the greater part is deposited near the mouths of the river in the Netherlands. It is by this sediment that the low banks of the Rhine are annually fertilised, and rendered capable of producing luxuriant crops of flax. In Holland, many originally sterile, sandy soils have been rendered most productive by such alluvial deposits.

4. The sea likewise plays an active part in changing the characters of the land near the shore, and in giving rise to new soils. Whilst, on the one hand, the constant motion of the waters is continually encroaching on the land in one place, washing away and carrying along with its waters the sands of the shore and the debris of the rocks at the sea-coasts, it deposits them partly again in other places on more sheltered shores.

From some of the materials which the sea-water contains in solution, many animals of the lower orders build up their skeleton and shells. Oyster-banks and coral-reefs are thus produced below the surface of the sea-level; gradually they rise above the water, forming often an extensive island, on which at first but few plants spring up. These die and manure the soil with their remains; a third layer of a more fertile soil is thus produced, on which a greater variety and number of plants may vegetate. In the course of time the decay of every succeeding generation adds to the mass of the soil, and the originally sterile coral-reef gradually becomes more and more capable of supporting a healthy vegetation.

5. Vegetable remains, to which we have already alluded, and especially animal remains, contribute more to the formation of some soils than might probably be expected. The waters of the river, but

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especially those of the sea, are animated by vast numbers of minute microscopic animals, called infusorial animals, each class of which is so organised as to live in its own special element only. Near the mouth of rivers, where salt and fresh waters mingle, myriads die daily, mix with the mud of the river, and are deposited with it along the banks, contributing much to the fertility of the alluvial deposits in these localities. The skeletons or envelopes of these infusorial animals, consisting chiefly of silica, after the death of the animalcules, appear as a whitish slime, which, notwithstanding the fact that many billions of these little creatures are required to fill the space of one cubic inch, nevertheless increase considerably the fine mud which the river deposits along its course near the sea-shore. Thus the mud which subsides on the shores of Northern Germany, and in the harbours along the coast, consists for the greater part of such organic remains. Higher up in the rivers their number decreases, and in places beyond the reach of the tide none of them are found. In the Elbe these animalcules have been observed as far as eighty miles above its mouth. In all tidal rivers, for instance the Rhine, the Thames, the Wash, the Forth, and the Humber, the mechanical debris brought down by these rivers, on being deposited, are intimately mixed with these more fertilising animal remains, and thus alluvial soils of the utmost degree of fertility are formed.

Although abundant proof has been advanced to convince the reader that a close *general* relation exists between the soil and the rock on which it rests, the supposition that this intimate connexion existed in every locality would lead to serious mistakes. In many places, indeed, the surface soils are totally different from those which would be formed by the degradation and decomposition of the subjacent rocks. Soils derived wholly from the rock immediately below them are confined to particular situations, such as steep escarpments and high level grounds, whereas the class of soils which do not partake of the general character of the subjacent rocks are by far the most numerous. The above observations on the formation of soils afford a ready explanation of this apparent geological anomaly; for when the chemical causes have prepared the ingredients of a rock for constituting a soil, other causes,—for instance, the mechanical influence of running water,—may interfere to transport them to a distant bed of very different composition.

Such are some of the more obvious and important causes which contribute to the change and formation of soils, as we observe them in action around us at the present day; and it is fair to assume that in past time they have been in operation, in conjunction with other mightier influences, in producing the present aspect of the earth's surface.

## ON VARIEGATION IN PLANTS.\*

BY DR. MORREN, PROFESSOR OF BOTANY IN THE UNIVERSITY OF LIEGE.

THE TRUE CAUSE OF VARIEGATION.

Coloured tissue abruptly limited to the median nerve, we are led to infer that here there exists an action which depends on the fibrous system. We are confirmed in this opinion when we observe those beautifully reticulated leaves, in which the whole fibrous network is white or yellow, while the intervening spaces (intervenium) remain green. But when the number of examples brought under consideration becomes multiplied, the frequent examples of leaves which are marginate, or bordered, or zoned, or discoidal, or fasciated, or variegated at the ends, present facts which could never be made to accord with this hypothesis. In the leaves which are fasciated, and those which are variegated at the end, the nerves, like the intervenium, are distinctly cut by a discoloured part, and the transition is abrupt. It would, therefore, seem impossible to admit that this phenomenon of variegation is caused by any excess of air forced into the leaf by the pneumatophorous vessels, when the root itself would, in too poor a soil, take up more air than sap. One might think so, as respects the leaves described under the names of maculo-variegate, reticulate, vittate, marbled, and half variegated; but the marginate leaves alone would overturn this theory.

The nature of our studies has naturally led us to submit the whitened tissues to a microscopic inspection, for it has appeared to us essential to examine first the differences of tissue, which might exist between the parts which are green and those which are variegated, and then seek for the cause of this strange phenomenon. We cannot here review all the features of the anatomy examined: besides the constant similarity which they presented leads us to think that the cause is the same under all circumstances. We therefore confine our remarks to Cornus mascula, Euonymus japonicus, and Syringa vulgaris.

º From Dodona a, ou Recueil d'observations de Botanique. Brussels.

Cornus mascula offers nothing particular either in its superior or inferior dermoidal system. Its

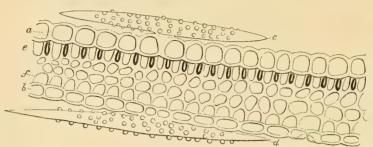


Fig. 1.—Cornus mascula, section of a variegated leaf:—a, superior epidermis: b, inferior epidermis; e, d, hairs; e, layer of emphysematous diachyma, the seat of the variegation; f, the rest of the green diachyma.

malpighiaceous hairs present the same aspect both on the variegated and the green parts. It is not so with the diachyma; this presents an important modiffication in its upper mesophyllar system which has its intercellular passages quite full of gas or air, while at the same time the granules of chlorophyll become blanched. We do not say that the air or gas is contained in

lacunæ or air-cells, for this part of the diachyma has no proper air-cells (Fig. 1, e). The small prismatic cellules are a little contracted or drawn in, in order to admit of the air lodging in the intercel-

lular passages, which thus exist inflated by an aëriform fluid, to the number of six around each cellule (Fig. 2). When the decoloration is complete, the same phenomenon takes place in the inferior mesophyllar system (Fig. 1, f.), which is naturally pierced with air-cells answering to the pneumatic compartments of the stomatic apparatus. Ordinarily, one portion of the superior mesophyllar system is affected with this secretion of air, while the inferior is still healthy.

The Euonymus japonicus is still more fitted to prove that variegation has its cause in the presence of air in the passages of the diachyma. Fig. 3 represents a dissection of a healthy part; and Fig. 4 that of a diseased or variegated part. The superior and inferior dermoidal system, the inferior mesophyllar system with its cellules, and air cavities remain the same, with this difference only, that the globules of chlorophyll are green in the one case (Fig. 3), and discoloured in the other (Fig. 4). The superior mesophyllar

system is alone changed. On one side, in the healthy part (Fig. 3), the cellular prisms (prismenchyma) firmly adhere to one another by the enchyma, or the intercellular substance which agglutinates all their partitions together. The result is, that here there are no intercellular passages, and consequently there cannot be any air between the cellules. On the other side (Fig. 4) the cellular prisms of the superior mesophyll are detached from one another, having air between them at their six angles (Fig. 5), so that the

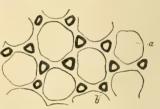


Fig. 2.-Cornus mascula, variegated: cellules of the variegated layers, seen from above; a, cellule; b, enclosed air in the intercellular passages.

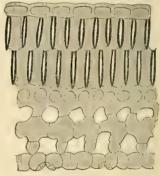


Fig. 4.-Euonymus japonieus; section of a diseased, or variegated leaf.

Fig. 3.-Euonymus japonicus; section of a healthy leaf.

passages are free from that intercellular substance which elsewhere binds the cellules to one another.

With this development of air, or gas, or aëriform fluid, the nature of which is unknown, is a corresponding whiteness of the interior chlorophyll. But we regard this phenomenon as of less importance than the secretion of the air between the cellules.

Fig. 5 .- Euonymus japonicus, variegated; the cellular tissue of the superior mesophyll, seen from above.

We are placed in possession of another fact not less important in the physiology of variegated leaves, by the anatomy of Syringa vulgaris (Fig. 6). In this plant, as with many others, there are several hues which constitute that form of variegation which we have called marbled. Some of these tints are pale green; others greenish yellow, here pure yellow abounds, and there we have pale or clear yellow; at last there is a pure white, and a brown colour, which indicates a carbonisation of tissue. Now whence arise these varied tints, proceeding from the green to the white, by numerous intermediate shades?

We have dissected such a portion (Fig. 6), and the anatomy will soon explain this phenomenon. The discoloration of the chlorophyll, and the formation (secretion) of the air bbetween the cellules, the emphysema,\*-since we must here call the malady by its own name-only affects the cellular J tissue of the superior mesophyll layer by layer. It follows that the first layer diseased is the superior; the second, that which comes below it; the third, that further down, and so on. We may, therefore, perceive why the

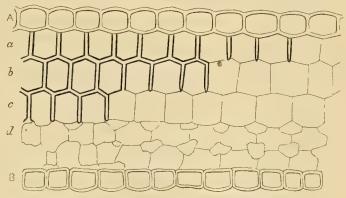


Fig. 6.—Syringa vulgaris; section of a variegated leaf of different tints; A, superior epidermis; B, inferior epidermis; a, cells of the first or upper emphysematous layer; b, cells of the second do.; c, cells of the third do.; d, cellules of the inferior mesophyll.

pale-green tint is only the index of a slight superficial commencing emphysema; why the greenish yellow tint indicates emphysema of several layers; in short, why the total discoloration is also only the result of a general emphysema, which has spread throughout the whole diachyma.

According to these views we must conclude that the double cause, which in one part discolours the chlorophyll, and in another encloses air in the intercellular passages which nominally are not destined to retain it, acts from above, downwards; that is to say, it commences in the mesophyllar system, which is destined for the rejection of substances, and may be regarded as exercising the function of secretion. We have examples in the gum, resin, &c., which varnish the upper surface of leaves. Moreover, it is this surface which receives most light, and least humidity when the rain does not fall directly on it. These observations naturally lead the mind to seek, in the effect of respiration, the cause of the phenomenon of variegation, which, on a close examination, is found to be only an emphysema of the cellular tissue.

M. Sageret, who made several very interesting experiments on variegation,† attributes this phenomenon to several causes, though he has not sought to resolve the question by an anatomical examination of the variegated parts—an essential point in a case of pathology, in which it is of the first importance to know the seat of the disease. According to this botanist, these causes would appear to be as follows:—

1. "The seed being too old, imperfectly ripe, defective conformation, &c."—Here it is not clearly stated how these conditions should produce variegation; the affirmation is vague, because it explains nothing.

2. "Variegation in the parent plants."—This fact is true; we have seen proofs of it in several gardens.

3. "Accident, or injury from insects."—Here we must remark that the difference of colour in a leaf pierced by an insect, or which is used as its nest, is not a true variegation. This phenomenon is local, and caused by a degeneracy or death of the tissues, as in the growth of epiphytal cryptogams on the green parts of the plants. Most frequently, the yellow tint which we observe on pear and apple trees, &c., is only an indication of the death of the tissue.

4. "Hybridation with a plant not variegated by the pollen of one variegated."—Here we must understand illegitimate crossing (impregnation taking place between two varieties of the same species), and not true hybridation (impregnation between two different species).

5. "Imperfect impregnation, in consequence of immaturity of the pollen;"—perhaps, more properly speaking, by the difference of coloration in the pollen, as has been observed in the production of the striation of the corolla.

6. "Contagion inoculated by the graft." - This result is placed beyond all doubt by daily experience.

\* A collection of air in the cellular tissues.

+ Sur le Moyen de faire naître les végéteux à feuilles panachées. Hort. Belg., 1836, p. 145.

To these we shall add one or two others.

7. Growth of the plant on a warm, arid soil, impregnated with air. The facts cited by M. Treviranus have been fully confirmed by what we have seen in every garden where there are trees with variegated leaves.

8. Propagation in dry weather. The fact cited by Miller belongs to this category of causes; and M. Sageret himself says, that budding, layering, twisting, ringing and tying, have produced variegation. We think these are secondary causes, and that with them there is a certain concomitant motion in the respiration so active that it is followed by emphysema in the secreting tissues. This last condition, which is fulfilled by exposure in a warm, aërated aspect, and an arid soil, has been entirely neglected by observers. It could only be detected by anatomical experiments on the plants, and but few have paid attention to the dissection of tissues.

9. The destruction of important organs of nutrition, by animals or other causes. The facts mentioned by Burgsdorf (p. 51) are to be explained by excess of the respiration directed to the

surviving parts of the plant.

After this exposition of facts, it appears that:-

(a) Variegation may be regarded as a malady.

(b) That it has its source in the cellular tissue of the diachyma.

(c) That it attacks especially the superior mesophyllar system, and spreads by layers, always from above downwards, so as to extend sometimes to the whole of the diachyma.

(d). That it results from emphysema without puffiness (emphysème sans boursouflure); on the contrary, with contraction of the tissue usually filled with elaborated sap.

(e). That this emphysema is confined to the intercellular passages, the intercellular substance or enchyma being replaced by air or gas, the nature of which is unknown.

(f). That this emphysema causes the discoloration of the granules of chlorophyll contained in the cellules of the variegated diachyma.

(g). That the variegation is always produced according to a certain number of types, which are repeated throughout numerous different orders and species; and that all variegated leaves may be distinguished by the following terms:—1, margined; 2, bordered; 3, discoidal; 4, zoned; 5, spotted; 6, reticulated; 7. striped; 8, marbled; 9, variegated by half; 10, variegated at the point; 11, fasciate; 12, entirely discoloured.

(h). That this last phenomenon constitutes albinism or complete whiteness in the leaf, and is never reproduced from seed; so that it is an individual malady.

(i). That the occasional causes of variegation are numerous, and have their source in many assignable conditions.

(j). That variegation is closely connected with disturbed vegetable respiration, and that, consequently, it is to plants what pulmonary emphysema is to animals: with the former, its seat is in the leaves, which are the true lungs of plants.

(k). That in this it is necessary to distinguish general emphysemas which affect the whole plant from local variegations.

## THE BEAUTIFUL AND PICTURESQUE IN GARDEN SCENERY.\*

MHE recognition of art, as Loudon justly observes, is a first principle in landscape gardening, as in all other arts; and those of its professors have erred who supposed that the object of this art is merely to produce a fac-simile of nature, that could not be distinguished from a wild scene. But we contend that this principle may be fully attained with either expression—the picturesque cottage being as well a work of art as the classic villa; its baskets and seats of rustic work indicating the hand of man as well as the marble vase and the balustrade; and a walk, sometimes narrow and crooked, is as certainly recognised as man's work as one always regular and flowing. Foreign trees of picturesque growth are as readily obtained as those of beautiful forms. The recognition of art is, therefore, always apparent in both modes.

If we declare that the Beautiful is the more perfect expression in landscape, we shall be called upon to explain why the Picturesque is so much more attractive to many minds. This, we conceive, is owing partly to the imperfection of our natures, by which most of us sympathise more with that in which the struggle between spirit and matter is most apparent, than with that in which the union is

<sup>\*</sup> From A Treatise on the Theory and Practice of Landscape Gardening. By A. J. Downing, Newburgh, New York. London: Longman and Co.

harmonious and complete; and partly because, from the comparative rarity of highly picturesque landscape, it affects us more forcibly when brought into contrast with our daily life. Artists, we imagine, find somewhat of the same pleasure in studying wild landscape, where the very rocks and trees seem to struggle with the elements for foothold, than they do in contemplating the phases of the passions and instincts of human and animal life. The manifestation of power is to many minds far more captivating than that of beauty.

All who enjoy the charms of landscape gardening may, perhaps, be divided into three classes: those who have arrived only at certain primitive ideas of beauty, which are found in regular forms and straight lines; those who in the Beautiful seek for the highest and most perfect development of the idea in the material form; and those who in the Picturesque enjoy most a certain wild and incomplete harmony between the idea and the forms in which it is expressed. The two latter classes embrace the whole range of modern landscape gardening.

There is no surface of ground, however bare, which has not, naturally, more or less tendency to a Beautiful or a Picturesque expression; and the improver who detects the true character, and plants, builds, and embellishes, as he should, constantly aiming to elicit and strengthen it, will soon arrive at a far higher and more satisfactory result than one who, in the common manner, works at random. The latter may succeed in producing pleasing grounds—he will undoubtedly add to the general beauty and tasteful appearance of the country, and we gladly accord him our thanks; but the improver who unites with pleasing forms an expression of sentiment, will affect not only the common eye, but, much more powerfully, the imagination, and the refined and delicate taste.

But there are many persons with small cottage places, of little decided character, who have neither room, time, nor income to attempt the improvement of their grounds fully, after either of those two schools. How shall they render their places tasteful and agreeable in the easiest manner? We answer, by attempting only the simple and the natural; and the unfailing way to secure this is by employing, as leading features, only trees and grass. A soft verdant lawn, a few forest or ornamental trees well grouped, walks, and a few flowers, give universal pleasure; they contain in themselves, in fact, the basis of all our agreeable sensations in a landscape garden (natural beauty and the recognition of art); and they are the most enduring sources of enjoyment in any place. There are no country seats so unsatisfactory and tasteless as those in which, without any definite aim, everything is attempted; and a mixed jumble of discordant forms, materials, ornaments, and decorations is assembled, a part in one style and a bit in another, without the least feeling of unity or congruity. These rural bedlams, full of all kinds of absurdities without a leading character or expression of any sort, cost their owners a vast deal of trouble and money, without giving a tasteful mind a shadow of the beauty which it feels at the first glimpse of a neat cottage residence, with its simple sylvan character of well-kept lawn and trees. If the latter does not rank high in the scale of landscape gardening as an art, it embodies much of its essence as a source of enjoyment.

Besides the beauties of form and expression in the different modes of laying out grounds, there are certain universal and inherent beauties common to all styles, and indeed to every composition in the fine arts. Of these we shall especially point out those growing out of the principles of UNITY, HARMONY, and VARIETY.

1. UNITY, or the production of a whole, is a leading principle of the highest importance in every art of taste or design, without which no satisfactory result can be realised. This arises from the fact, that the mind can only attend, with pleasure and satisfaction, to one object, or one composite sensation, at the same time. If two distinct objects, or classes of objects, present themselves at once to us, we can only attend satisfactorily to one by withdrawing our attention, for the time, from the other. Hence the necessity of a reference to this leading principle of unity.

In Landscape Gardening, violations of the principle of unity are often to be met with, and they are always indicative of the absence of correct taste in art. Looking upon a landscape from the windows of a villa residence, we sometimes see a considerable portion of the view embraced by the eye laid out in natural groups of trees and shrubs; and upon one side, or perhaps in the middle of the same scene, a formal avenue leading directly up to the house. Such a view can never appear a satisfactory whole, because we experience a confusion of sensations in contemplating it. There is an evident incongruity in bringing two modes of arranging plantations, so totally different, under the eye at one moment, which distracts rather than pleases the mind. In this example, the avenue, taken by itself, may be a beautiful object, and the groups and connected masses may in themselves be clegant: yet if the two portions are seen together, they will not form a whole, because they cannot make a composite idea. For the same reason, there is something unpleasing in the introduction of fruit trees among elegant ornamental trees on a lawn; or even in assembling together, in the same beds, flowering plants and

culinary vegetables—one class of vegetation suggesting the useful and homely alone to the mind, and the other, avowedly, only the ornamental.

In the arrangement of a large extent of surface, where a great many objects are necessarily presented to the eye at once, the principle of unity will suggest that there should be some grand or leading features to which the others should be merely subordinate. Thus, in grouping trees, there should be some large and striking masses to which the others appear to belong, however distant, instead of scattered groups, all of the same size. Even in arranging walks, a whole will more readily be recognised, if there are one or two of large size, with which the others appear connected as branches, than if all are equal in breadth, and present the same appearance to the eye in passing.

In all works of art which command universal admiration, we discover a unity of conception and composition, and a unity of taste and execution. To assemble in a single composition forms which are discordant, and portions dissimilar in plan, can only afford pleasure for a short time to tasteless minds, or those fond of trifling and puerile conceits. The production of an accordant whole is, on the contrary, capable of affording the most permanent enjoyment to educated minds, everywhere, and at all periods of time.

- 2. Variety is a fertile source of beauty in Landscape Gardening. Variety must be considered as belonging more to the details than to the production of a whole; and it may be attained by disposing trees and shrubs in numerous different ways, and by the introduction of a great number of different species of vegetation, or kinds of walks, ornamental objects, buildings, and seats. By producing intricacy, it creates in scenery a thousand points of interest, and elicits new beauties, through different arrangements, and combinations of forms and colours, light and shades. In pleasure-grounds, while the whole should exhibit a general plan, the different scenes presented to the eye, one after the other, should possess sufficient variety in the detail to keep alive the interest of the spectator, and awaken further curiosity.
- 3. Harmony may be considered the principle presiding over variety, and preventing it from becoming discordant. It indeed always supposes contrasts, but neither so strong nor so frequent as to produce discord; and variety, but not so great as to destroy a leading expression. In plantations, we seek it in a combination of qualities, opposite, in some respects,—as in the colour of the foliage; and similar in others more important,—as the form. In embellishments, by a great variety of objects of interest, as sculptured vases, sundials, or rustic seats, baskets, and arbours, of different forms, but all in accordance, or keeping, with the spirit of the scene.

To illustrate these three principles, with reference to Landscape Gardening, we may remark, that, if unity only were consulted, a scene might be planted with but one kind of tree, the effect of which would be sameness; on the other hand, variety might be carried so far as to have every tree of a different kind, which would produce a confused effect. Harmony, however, introduces contrast and variety, but keeps them subordinate to unity, and to the leading expression, and is, thus, the highest principle of the three.

In this brief abstract of the nature of imitation in Landscape Gardening, and the kinds of beauty which it is possible to produce by means of the art, we have endeavoured to elucidate its leading principles, clearly, to the reader. These grand principles we shall here succinctly recapitulate, premising that a familiarity with them is of the very first importance in the successful practice of this elegant art, viz.:—

THE IMITATION OF THE BEAUTY OF EXPRESSION, derived from a refined perception of the sentiment of nature.

THE RECOGNITION OF ART, founded on the immutability of the true, as well as the beautiful.

THE PRODUCTION OF UNITY, HARMONY, AND VARIETY, in order to render complete and continuous our enjoyment of any artistical work.

Neither the professional landscape gardener nor the amateur can hope for much success in realizing the nobler effects of the art, unless he first make himself master of the natural character or prevailing expression of the place to be improved. In this nice perception, at a glance, of the natural expression, as well as the capabilities of a residence, lies the secret of the superior results produced even by the improver, who, to use the words of Horace Walpole, "is proud of no other art than that of softening nature's harshness, and copying her graceful touch." When we discover the Picturesque indicated in the grounds of the residence to be treated, let us take advantage of it; and while all harshness incompatible with scenery near the house is removed, the original expression may, in most cases, be heightened,—in all, rendered more elegant and appropriate, without lowering it in force or spirit. In like manner, good taste will direct us to embellish scenery expressive of the Beautiful, by the addition of forms, whether in trees, buildings, or other objects, harmonious in character, as well as in colour and outline.





#### OSBECKIA STELLATA.

Nat. Order .- MELASTOMACEÆ.

Generic Character.—Osbeckia, Linnæus.—Calyx with an ovate or oblong tube, adherent to the base of the ovary below, frequently clothed with setæ from a palmate base, or stellate, or very rarely simple hairs; limb four or five toothed, the segments alternate, with an equal number of appendages. Corolla of four or five petals, inserted on the throat of the calyx, alternate with its lobes, ovate or obovate. Stamens eight or ten, inserted with the petals, sub-equal; anthers oblong-linear, slightly curved, beaked, with one pore; the connective thickened at the base, shortly two-spurred, or with a pair of auricles in front, or without appendages. Ovary half-inferior, free at the summit, conically setose, four or five celled; cells with many ovules; style filiform, thickened below the summit; stigma punctiform. Capsule dry, included in the tube of the calyx,

which is truncate above, four or five celled, loculicidally four or five valved at the apex. Seeds numerous, cochleate.—Shrubs or undershrubs, growing in tropical Asia and Africa, mostly roughly setose; branchlets more or less four-sided; leaves opposite, very rarely whorled, veined, almost entire; flowers terminal, often capitate, with involucral bracts, sometimes solitary, more rarely racemose or sub-corymbose, purpurascent, showy.—(Endlicher Gen. Plant. 6221.)

OSBECKIA STELLATA, Don.—Star-like Osbeckia,—Suffruticose, branches rough with appressed bristles; leaves stalked, lanceolate oblong, acuminate, five-nerved, slightly bristly; cymes terminal; calyx-tube elongated, urecolate, with numerous pectinately ciliated scales; lobes short, deciduous.

ESCRIPTION.—An erect shrub, two feet or more high, setulose-hispid; branches foursided, opposite, more rarely alternate, becoming red above. Leaves opposite, spreading very much, two to six inches long, about one-third as broad, green, hispid; leaf-stalks reddish, many times shorter. Flowers lilac-rose, showy, about two inches across, terminal or rarely axillary, solitary or in pairs, often crowded, almost sessile, on a short thick four-sided pedicel. Calyx oblong-urceolate, pale green, an inch long (subtended in the bud by broadly ovate, membranous, fuscous, ciliate, caducous bracts); limb deciduous, four-parted, segments spreading like a star, straight, lanceolate-linear, loosely hairy, with pencils of setæ, terminating in a radiating tuft of bristles, several similar in each of the sinuses. Corolla of four petals, spreading widely; petals obcordate-rounded, ciliated, veined. Stamens eight, equal, included, rising in a curve, loosely fascicled, yellow, glabrous; anthers equal to the filaments or longer, linear, beaked, sigmoidly curved, terminated in a long beak, affixed by the declined sub-cordately acuminate base, without intermediate stalk, to the filament. Style inclined in a direction contrariwise to the stamens, curved at the upper part; stigma a green simple terminal sub-pubescent point. Ovary sunk in the calyx, roundly ovate, ending in a bristly tapered point. Capsule dry, four-celled, enveloped in the calyx; receptacles four, one half the length of the axis, to which they are longitudinally attached.—A. H.

HISTORY, &c.—Introduced in 1821 or 1822 from the Botanic Garden at Calcutta. It is a native of Nepal. There exist two very distinct varieties; one of which has the fringed scales clothing the calyx so closely that the whole surface is covered with a mass of entangled bristles; the other has the calyx narrower, with the scales wider apart. Though a showy species, it appears to have gone out of cultivation. Our drawing was made from plants raised from seeds communicated by Mr. D. Moore, from Glasnevin, to the garden of the Apothecaries' Society. It is worth a place among select stove plants.

Culture.—A free-growing plant, requiring a cool stove temperature while growing, and liberal treatment; and to be kept rather cooler and drier when at rest. A compost of sandy loam, peat, and leaf-mould, suits it. It may be propagated by cuttings, treated in the usual way, in a hotbed, or propagating house, in spring.—M.

## ON THE APPLICATION OF COAL SOOT AS MANURE.

By Mr. J. TOWERS, MEMBER OF THE HORTICULTURAL AND ROYAL AGRICULTURAL SOCIETIES.

TTENTION has been roused by an interesting article which recently appeared in the Mark Lane Express, on the qualities and value of this substance to the gardener and farmer. It is a curious fact, that while we have possessed minute analyses of wood soot, which, as a manure, is of far less importance than the soot of coal, the strict investigation of the latter has been comparatively neglected. From the nature of its chief components, some idea may be formed of the reason why it should be so efficacious when applied under certain circumstances. I will endeavour to point out a few facts that

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may induce cultivators to pay a little more attention to a substance which most persons endeavour to get rid of as a black nuisance, actually paying the chimney-sweeper for taking that which, if judiciously applied, would not only fertilize the ground, but repel, if not destroy, many of the insects and cryptogamous plants that prey upon and injure crops of great value.

Coal soot contains a very large proportion of carbon or charcoal, in a state of extremely minute division, combined with considerable quantities of the two neutral salts of ammonia—namely, the sulphate, whereby also sulphuric acid is conveyed to the soil; and the hydro-chlorate, more familiarly known as the muriate: that is, sal ammoniac.

They who possess the early published parts of the Royal Agricultural Society's Journal, can refer to and peruse the instructive article by Mr. Morton, on the use of soot at Stinchcomb farm, in Gloucestershire, long occupied by Mr. Dimmeny, who purchased vast quantities of soot, and depended upon it to a very great degree, as a staple manure for potatoes, wheat, and grass pasture. If the latter, and indeed, the garden lawn, the orchard, or paddock, be infested with mosses, a careful top-dressing of coal soot will act not only as a specific remedy, but also as a genuine fertilizer.

Again, it is recorded in the work alluded to, that in July 1844, Lord Essex produced two specimens of turnips raised by him in different ways, during that most pinching season. One of them was very luxuriant: the seeds were sown in drill, with a small quantity of charcoal dust: a second-not a third of the height—was otherwise treated; and it was stated that a third parcel of seed, sown alone, failed to germinate at all, until some rain fell. I happened to see these specimens. To the agency of charcoal—however that substance, insoluble in water, might act—was ascribed the luxuriance of the first specimen. The absorption of ammoniacal gas by charcoal has been looked to as the exciting cause of such vegetative activity; and if so, then soot, which abounds with charcoal, impregnated with soluble ammoniacal salts, ought, upon chemical principles, to be found a valuable adjunct to the dunghill. When treated with hot water coal soot yields a brown, bitter extract, identical perhaps with a peculiar bitter principle, styled asboline by Braconnot, in his analysis of wood soot. If so, we may regard it as an alkaloid, held in solution by the sulphuric acid developed during combustion of the sulphur contained in mineral coals. This brown fluid, amply diluted with soft water, is one of the best forms of liquid manure that can be used for Pine Apples, and other plants that are proved to be benefited by such applications. Great caution, however, must be entertained whenever solutions of saline substances are resorted to,-and such are soot, guano (rich in sulphate, muriate, and oxalate of ammonia), Potter's guano, &c.

Davy and other writers have recommended the scattering of coal soot over the surface of the soil. This practice will answer well on mossy grass land; but as a manure for the garden or field it would be better to renew spit dung or compost heaps, by mixing it with either, before dunging the land, for thereby the ammonia lost during the heat of active fermentation, would be restored in the condition of a more durable neutral salt.

## BOTANICAL FRAGMENTS.

Chlorosis.—Every day's experience shows that plants grown without the influence of light, instead of presenting their usual green hue, assume a white or yellowish aspect, due to the imperfect formation of chlorophyll. As the tissues of such plants are less compact, and the flavour often more delicate, this effect is frequently produced artificially, and is then known by the name of blanching. Plants, however, when fully exposed to light, but placed in a situation or under circumstances unfavourable to healthy growth, often exhibit a modification of the same appearance; and individuals, under any treatment, from some original injury to the embryo, or some natural weakness of constitution, never acquire a healthy aspect. It is scarcely possible to examine a field of barley or beans without finding some such individuals; and they frequently occur in gardens. Other seedlings of the same species, which have been subjected to precisely the same treatment, flourish uniformly from the first, while these never acquire a green tinge, and at length perish. Indeed, when plants exhibit this pallid hue for any marked length of time, from their first appearance above the surface of the soil, whether seedlings or shoots from roots of the preceding year, they very rarely become healthy. Doubtless, in many cases, ungenial weather and a damp soil have originated the evil; but better treatment except the disease be of comparatively recent origin—will seldom be effectual. It has been recommended to water them with a weak solution of sulphate of iron, but we do not know with what effect. Frequently, however, the disease is neither constitutional, nor of very early origin, but entirely dependent on cold, wet, cloudy weather, such as is often prevalent in this country late in the

spring. Under such circumstances, we see whole crops assume a yellow appearance; and, unless a favourable change takes place, the plant goes off entirely, or yields only weak and imperfect spikes. Fruit-trees, in badly-drained ground, where the roots are always in a lower temperature than is consistent with health, are often similarly affected. Timely draining and improvement of the soil, where needful, is the only remedy; but it is easier to prevent disease by proper treatment at first than to prevent it when once established. This disease is not to be confounded with variegation. It is, perhaps, more nearly related to what is called by Meyen (Gelbsucht) jaundice, which is a partial affection, confined to particular shoots. The term chlorosis (Bleichsucht) has been objected to. It is not, however, inexpressive, and unlikely to lead to any mistake as to the cause of the disease; it is suggestive merely of a pale, sickly hue (Bleiche), in contradistinction to a bright green, which is the point intended to be kept in view.—Rev. M. J. Berkeley in Morton's Cyclopadia.

The Stylidium mucronifolium, described at page 184 (vol. ii.) is thought by Dr. Planchon to be distinct from the species described under that name by Sonder, and he proposes to call it S. Hookeri, in compliment to Sir W. Hooker. Our description applies to S. Hookeri. According to Dr. Planchon, the true S. mucronifolium differs in its scaly collar, in its leaves being radical instead of produced on a short stem, in its scape being all hirsute instead of smooth above, in the lip of the flower being inappendiculate instead of appendiculate on both sides, and in the relative length of the capsule.

Mr. Weddell states that on the inner surface of the base of the Stipules of Cinchona and allied genera, he has observed numerous small glands which secrete a gummy fluid. In Cinchonas the secretion is transparent and fluid, while in several other genera it is solid and opaque, and seems to glue the stipules to the bud which they embrace: this is particularly the case in Pimentelia glomerata. In Rondeletia the secretion is soft, like wax, and of a beautiful green colour. The inhabitants of Peru give it the name of Aceite-Maria, or Oil of Mary; they collect it carefully, and use it as an external application in various diseases. The stipular glands have an oval or lanceolate form, and are somewhat pointed. The axis of the gland is in the form of an elongated cone; it is composed of elongated and dense cellular tissue. Dr. Balfour has examined these glands in many Cinchonaceæ, and detected them in fresh specimens of the following species:—Cinchona Calisaya, Burchellia capensis, Cephaelis Ipecacuanha, Coffea arabica, Ixora javanica, Mussænda frondosa, Rondeletia speciosa, Pavetta indica, Luculia gratissima and Pinceana, Pentas carnea, Gardenia Stanleyana, and other species. In some the secretion was found to be beautifully coloured.—Report of Ed. Bot. Soc.

The Mimosa Bark of commerce is the bark of Acacia dealbata, and pays to ship it to England, not-withstanding the distance, from the fact of its containing a greater per centage of tannin than any other bark. It is a handsome tree, from fifteen to thirty feet high, forming luxuriant groves on the banks of streams, most abundant in Port Philip, and Twofold Bay, between the parallels of latitude thirty-four degrees and thirty-cight degrees. These groves, when in full blossom, send forth a fragrance which may be detected several miles distant, and on approaching them, they present one of the most picturesque features in Australian forest scenery.—Ib.

A bed of *Peat* in Cantyre, which occurs in an extensive flat or plain very little raised above the existing level of the sea, full of peat mosses, strata of clay, with vegetable stems, &c., described by Dr. Balfour, is remarkable on account of its containing an immense accumulation of leaves which are comparatively unaltered in their structure. It must be of ancient date, as it is covered by clay and gravel, and there is reason to believe that a peat moss now cut away lay over it. This moss, where it remains still uncut, is from ten to twelve feet in depth. The forms of the leaves are well marked, and the following appear to occur:—Leaves of Salix Caprea, and viminalis or stipularis; Rumex Acetosella; stem and leaves of a Moss; stems of grasses and of a rush; leaves of a heath-like plant, either Empetrum nigrum, or a species of Erica; epidermis of Birch. Woody and vascular tissue had been detected; also scalariform vessels indicating the remains of ferns. The leaves, which have been examined by Dr. Voeleker, give the following result:—Ash from leaves dried at 212°—32 46. The ash is of a reddish colour, apparently from the presence of oxide of iron, and resembles ordinary peat-ashes in many respects.

Those who are interested in the culture of *Hardy Ferns* will be glad to learn, that Niphobolus Lingua succeeds on rockwork in the open air in the climate of Devonshire. It may thus be seen in the nursery of Mr. Pince, of Exeter.

The Reindeer Moss (Cenomyce rangiferina), without which these animals cannot thrive, and which seems to form almost their only food, is of a pale greenish yellow, and resembles a dry lichen rather than a moss. At first sight it appears a most miserable, uninviting, and wretched fare; but on plucking it up, you discover that it is of a succulent spongy nature, and the under part, which is not exposed

to the sun and wind, retains a great deal of moisture, and is highly nutritious. I never saw a plant more deceptive. Often and often, when halting for the mid-day meal, or the siesta which my Norwegian companion would never omit, have I been tempted by its dry, soft exterior, to throw myself on a bed of this moss, and as regularly have I arisen from it wet to the skin, as if I had been lying in a marsh; neither did the experience bought by such discomfiture avail to warn me from making the attempt again and again, so inviting does this moss look, and so much does its dry appearance belie the reality of its nature.—Rev. A. C. Smith, in Zoologist.

Mr. Quekett recently mentioned to the Microscopical Society a new fact in vegetable physiology, viz., the unrolling (in a spiral manner) of the membranous wall of an elongated vegetable cell. The specimens used in illustration were hairs taken from the fruit of Cycas revoluta, from China. Upon detaching some of these hairs, which are situated on two opposite parts of the fruit, and examining them with a power of 250 diameters, two varieties were distinctly visible, viz., perfect hairs, having both extremities more or less pointed, and others, in which the extremity attaching them to the seed was abruptly broken off; when these last were carefully examined, the broken ends were, in most cases, found unrolled, in a spiral direction; the spiral being in the form of a band, the breadth of which gradually increases from below upwards. In these hairs there was no trace whatever of a spiral fibre, the membrane forming the wall being quite transparent and free from structure. In most of the works on botany, no mention is made of the manner in which vegetable membrane is capable of being torn. Dr. Lindley, however, in the last edition of his Introduction, states that it generally tears irregularly, but that in Bromelia nudicaulis the torn edges are curiously toothed; but no instance is given in which the fractured portion is always in a spiral form.

Bryanthus erectus is the name under which a beautiful dwarf hardy shrub is now cultivated in British gardens. The plant flowers abundantly in the months of May and June, producing delicate rose-coloured flowers resembling miniature Kalmias. The original plant was produced in 1841 by Mr. James Cunningham, of the Comely-bank Nursery, from seed of Phyllodoce (Menziesia) empetriformis fertilised with pollen of Rhododendron (Rhodothamnus) chamæcistus. It is, therefore, a true bi-generic hybrid, very few instances of which occur. It is obviously not at all entitled to the generic name of Bryanthus, and would be better called Phyllodoce chamæcistus.—M.

## New and Kare Plants.

ERYTHRINA ERYTHROSTACHYA, Morren. Coral-stalked Erythrina. (Ann. de Gand., v., t. 291).—Nat. Ord., Fabaceæ § Papilionaceæ-Phaseoleæ.—A very handsome stove shrub, having the stems, petioles, and under side of the leaves furnished with prickles. The leaves are trifoliolate, with deltoid-acuminate smooth leaflets. The flowers form terminal racemes six inches long, the blossoms being about two inches long, arranged in fascicles of three together, and very numerous. The colour is a brilliant searlet, and the calyx also as well as the rachis is coloured red. Its origin is unknown. It was purchased in 1832, by M. Cachet, of Angers, from M. Verleuwen, of Ghent, under the name of E. speciosa; and was published by M. Morren, a year or two since, in the Ghent Annals. It flowers during summer.

Skimmia Japonica, Thunberg. Japanese Skimmia. (Paxt. Fl. Gard., ii., 56).—Nat. Ord., Aurantiaceæ.—Syn., Limonia laureola, Wallich.—An interesting evergreen half-hardy shrub, growing in its wild state from three to four feet high, but taller when cultivated. The leaves are elliptic, bright green, and have an aromatic acrid flavour. The flowers grow in terminal panicles, and are greenish white; they are small, five petalled, and are said to be deliciously fragrant, with a perfume not unlike that of Daphne odora, and particularly strong in the evening. It will associate well with Camellias, Oranges, Daphnes, &c. To us the scent of the flowers resembled that of privet blossoms. From China, Japan, and the Himalayan Mountains. Introduced about 1850. Flowers in the early spring months. Messrs. Standish and Noble, of Bagshot.

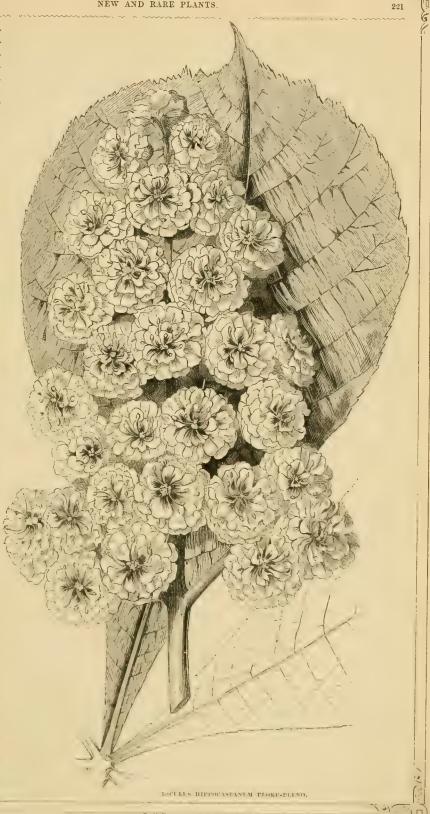
Acacia Cyanophylla, Lindley. Black Wattle (Paxt. Fl. Gard., ii., 56).—Nat. Ord., Fabaceæ § Mimoseæ-Acacieæ.—A handsome evergreen small tree, with drooping branches, loaded with long lanceolate phyllodes, often a foot long, of a glaucous green, almost blue, from the axils of which proceed long spikes, of a dozen or more globular heads of deep yellow flowers. It is one of the handsomest of the Acacias, for a conservatory. From Swan River, occurring in wet sandy flats. Introduced in 1838. Flowers in February and March.

PITCAIRNIA EXSCAPA, Hooker. Stemless Pitcairnia (Bot. Mag., t. 4591).— Nat. Ord., Bromeliaceæ.—A curious stove epiphytal herb, forming a kind of pseudo-bulb, from whence grow the linear carinated leaves, many of them three feet long, and resembling those of a coarse carex. The flowers, amongst a crowded head of imbricating bracts, are seated close down in the heart of the leaves; they are scarlet, several together in an ovate head. From New Grenada. Introduced accidentally among some orchidaceous plants in 1850. Flowers? Messrs. Jackson of Kingston.

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ÆSCULUS HIPPO-CASTANUM, FLORE-Double-PLENO. flowered HorseChestnut.-Nat. Ord., Sapindaceæ § Hippocastaneæ. - A rather uncommon, and very ornamental tree, equalling in vigour the common sort, from which it differs only in its double flowers. These are very showy, having a strong resemblance to those of a good double Hyacinth; they are pale blush, with deeper red at the base of the petals. Our figure was made from a specimen communicated by Mr. Rivers, nurseryman of Sawbridgeworth, who informs us that he "received it from the Continent some seven or eight years since." The spike of flowers we have represented was not so long as is usual, owing to the tip having been killed by frost in May. The trees flower when quite young.

PUYA MAIDIFOLIA, Maize-Decaisne. leaved Puya. (Ann. de Gand., v., t. 289). -Nat. Ord., Bromeliaceæ. - A very handsome stove perennial, with an erect stem, terminated by a long spike of flowers, and clothed on the lower part by acute subcylindrical scalelike leaves. The rootleaves are elongate lanceolate, somewhat wavy on the margin, resembling those of the Indian corn. The flowers are pale greenish yellow, about two inches long, issuing from the axils of



ovate-lanceolate pointed imbricating bracts, which are of a bright rosy crimson, slightly tipped with green. From the Caraceas. Introduced to the Belgian gardens by M. Linden about 1848. Flowers in September.

RANUNCULUS SPICATUS, Desfontaines. Spike-fruited Crowfoot. (Bot. Mag., t. 4585).—Nat. Ord., Ranunculace. Ranunculace.—Syn., R. olyssiponensis, Persoon.—A rather common-looking hardy herbaceous plant, the roots consisting of a dense cluster of fusiform fleshy fibres or tubers along with many capillary roots. The stem grows a foot or more high, and is hirsute with soft spreading hairs; the leaves also are hairy, the lower ones on long stalks roundish kidney-shaped, three or five lobed, the lobes wedge-shaped and incised. From one to six flowers are borne on a stem; they are two inches broad, glossy yellow, with flabelliform orange-coloured spots at the base of each petal. From Algiers. Introduced in 1849? Flowers in April. Royal Botanic Gardens, Kew.

Acacia Viscidula, Bentham. Clammy-leaved Acacia (Paxt. Fl. Gard., ii. 74).—Nat. Ord., Fabaceæ § Mimoseæ-Acacieæ.—Syn., A. ixiophylla, of gardens.—A small very ornamental greenhouse evergreen shrub, of erect habit, having the slender branches clothed with linear phyllodes, which, as well as the branches, are covered with a glutinous secretion, the cracking of which, when dry, gives the edges a broken appearance. The globular heads of deep yellow flowers, produced on short stalks from the axils of the phyllodes, are often in pairs, but disunited. From New South Wales. Introduced in 1844. Flowers throughout the spring months. Horticultural Society of London.

Calceolaria tetragona. Bentham. Tetragonal Slipperwort (Paxt. Fl. Gard., ii. 70).—Nat. Ord., Scrophulariaceæ § Antirrhinideæ-Calceolareæ.—A pretty compact evergreen greenhouse bush, clothed with pale green broad oblong blunt entire leaves, three to four inches long, covered with a glutinous exudation. The flowers terminate the shoots, and grow in loose terminal corymbs; they are large, pale yellow, with a large yellow green calyx, and pouch-shaped pale yellow corollas, having a squarish outline on the face. It will probably be useful as the parent of a race of more showy varieties, with a better habit than the florists' Calceolarias now in cultivation, being truly shrubby, with good foliage, and quite distinct in character from any species in cultivation. From Peru. Introduced in 1849. Flowers in June. Messrs. Veitch of Exeter.

BIFRENARIA HADWENII, Lindley. Hadwen's Bifrenaria (Paxt. Fl. Gard., ii., 67).—Nat. Ord., Orchidaceæ § Vandcæ-Maxillaridæ.—Syn., Scuticaria Hadwenii, of gardens.—A stove epiphyte, "with the appearance of a Brasavola;" the leaves from twelve to fourteen inches long. The flowers are solitary, about three inches in diameter when expanded, with the sepals and petals undulate and acuminated, dull nankeen colour, with broken brown bars, the lip resembling a slipper, paler, with rose-coloured streaks, hairy on the upper side, with a three-toothed crest on the centre. From Brazil. Introduced in 1850? Flowers in May. T. Brocklehurst, Esq., of Macclesfield.

PLEIONE HUMILIS, D. Don. Humble Pleione (Paxt. Fl. Gard., ii. t. 51).—Nat. Ord., Orchidaceæ § Epidendræe-Cœlogynidæ.—Syn., Epidendrum humile, Smith; Cymbidium humile, Smith; Cœlogyne humilis, Lindley.—A beautiful little Alpine epiphyte, with flask-shaped furrowed pseudo-bulbs which flower when the leaves are absent. The peduncles are clothed with petaloid bracts longer than the ovary, but afterwards shrivelling and drawing back, leaving the peduncle naked. The flowers are tinted with pale lilac, the lip with a broad margin of red spots; the sepals and petals are linear lance-shaped, spreading; the lip hooded emarginate, fringed at the edge, the base with six distant fringed veins. From Northern India; Khasijah hills, at 7000 feet elevation. Introduced by Mr. T. Lobb, in 1850. Flowers in spring. Messrs. Veitch of Exeter.

Cattleya Pallida, Lindley. Pallid Cattleya (Paxt. Fl. Gard., ii. t. 48).—Nat. Ord., Orchidaceæ § Epidendreæ-Læliadæ.—A handsome stove epiphyte, with long furrowed pseudo-bulbs, each bearing one oblong very blunt emarginate leaf. The flowers are solitary from a very large spathe, and are large and showy, a good deal resembling some of the pale varieties of C. labiata. The sepals are lanceolate, the petals oblong, wavy, four times as broad as the sepals; all these very pale, nearly white. The lip is oblong emarginate, rather wavy, and hooded a little way at the base; there is a broad obcordate patch of yellow in the centre of the lip, the rest of the lip being pink. From Tepic, in the west of Mexico. Introduced by Mr. Hartweg, in 1846. Flowers in July. Horticultural Society of London.

ATACCIA CRISTATA, Kunth. Crested Ataccia (Bot. Mag., t. 4589).—Nat. Ord., Taccaceæ.—Syn., Tacca integrifolia of gardens; T. cristata, Jack; T. Rafflesiana, Jack.—A curious stove herbaceous plant, with a few oblong dark purple-green leaves, and a scape about equalling them in length, terminated by a drooping umbel of brown purple flowers, with an involucre of two short spreading bracts, and two erect leaf-like ones rising above the flowers, from amongst which hang several long tendril-like threads, which are sterile peduncles. From the Malay Islands. Introduced?—— Flowers in May.

Achimenes viscida, Lindley. Clammy Achimenes (Paxt. Fl. Gard., ii. 59).—Nat. Ord., Gesneraceæ § Gesneræ.—Syn., Cheirisanthera atrosanguinea, of gardens.—A rather pretty stove herbaceous plant, growing erect, from two to three feet high, covered all over with clammy hairs. The leaves are opposite, ovate oblong, with crenated margins; from their axils come the few-flowered cymes of tubular blossoms, of a deep crimson, with a white throat. Native country not known. Introduced from the Continental gardens in 1850. Flowers most part of the year.

ROSA FORTUNIANA, Lindley. Fortune's Rose (Paxt. Fl. Gard., ii. 71).—Nat. Ord., Rosaceæ § Rosidæ.—A hardy evergreen shrub of little beauty, related to the Banksian Rose. It is a scrambling shrub, with slender branches, armed with small falcate prickles; the leaves ternate or quinate, with ovate-lanceolate sharply serrated

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shining green leaflets. The flowers are double, about three inches in diameter, white, growing singly on short setose peduncles, having a naked hemispherical calyx tube, and ovate undivided sepals. Probably a Chinese garden variety. From China. Introduced in 1846 by Mr. Fortune. Flowers in summer. Horticultural Society of London.

Drimiopsis Maculata, Lindley. Spotted-leaved Drimiopsis (Paxt. Fl. Gard., ii. 73).—Nat. Ord., Liliaceæ § Scilleæ.—A greenhouse bulb of little beauty. The leaves, which arise from the bulb, are broad, fleshy, oblong, six or eight inches long, rolled up at the base, and clouded on the surface with dark green stains upon a paler ground. The scape, about as long as the leaves, is terminated by a close raceme of small half-closed bell-shaped flowers, the lower ones green and pendulous, the upper white and erect. Allied to Drimia and Lachenalia. From the Cape of Good Hope. Introduced in 1849. Flowers in ————. Horticultural Society.

## LITERARY NOTICES.

Babington's Manual of British Botany (Van Voorst).--Much has been accomplished in the critical investigation of our indigenous vegetation within the last few years, in great measure owing, as we think, to the publication of the earlier editions of the work now under notice. The first edition, issued in 1843, was so immeasurably superior to all that had preceded it on the same subject, and in anything like the same compass, that we do not feel surprised it should have been so well received as to render the publication of a third edition now necessary. Arranged according to the natural system, a multum in parvo in style, and abounding in acute criticisms and remarks, no portable publication relating to British plants could at all compare with Mr. Babington's until the appearance of the very much improved and recently issued sixth edition of Hooker's British Flora, by Dr. Walker Arnott. That work and the present may be said to represent the views of two opposite parties of British botanists, the one having a penchant for lumping the species of others, the other for dividing so-called species; but the result is, that the two books taken together, and compared with each other, furnish the student of our native plants with more ample and valuable materials in aid of his studies, than has ever before existed; and perhaps as to the question of species, it is of little importance which authority he follows, for nothing within the whole range of botany is so indefinite as this question of what constitutes a species. All the attempts that have been made to throw light on the subject have only, as it appears to us, in reality obscured it. The present edition, we are told, has been carefully revised, so as to keep pace with the rapidly advancing knowledge on the subject of British plants. On comparing it with the last edition published in 1847, we find, among other changes and additions, that under Thalictrum, is an increase of two species, T. flexuosum, Reich. and T. saxatile, D.C.; of Ranunculus we have two new species, R. confusus, Godr., and R. tripartitus, D.C.: under Sagina, is the addition of S. ciliata, Fries; of Rubi, seven species are added; Hieraccum is altogether newly east, and contains twenty-seven species, instead of twenty-one, as in former editions; Linaria is reduced from ten to eight, by the omission of L. italica, and L. sepium, said to be hybrids between L. repens and vulgaris; Atriplex is reduced from eleven to nine; Salix is reduced from fifty-eight to thirty-three; Carex seventy-two instead of seventy, and newly arranged. Among the ferns, Mr. Babington adopts the variety incisa of Lastrea Filix-mas; and places Lastrea uliginosa of Newman as a variety of L. cristata, as we had already proposed to do; Cystopteris dentata is separated from C. fragilis; and a variety latifolium is added of Athyrium Filix-feemina. Of the larger genera throughout the volume, an index of species, printed at the end of the genus, will be found a very convenient addition. Many of the genera, too, have been rearranged in an analytical manner, greatly to the advantage of the student. Altogether we must consider this as the best text-book on the subject of British Botany now extant.—M.

Summer Life on Land and Water at South Queensferry. By W. W. Fyfe. (Edinburgh: Oliver and Boyd).—Queensferry is a quiet country burgh, lying on the south banks of the Forth, some nine miles west from Edinburgh. Although now seeluded from the world—a still retreat inviting the lover of solitude—it figures as an important place in ancient Scottish history, and a halo of stirring events surround its name, of great interest to the historian. The object of the elegantly-illustrated work whose title is here appended, is to elucidate the historical interest of Queensferry, and, in connection therewith, its antiquarian relies; but it pleases us much to see that, in addition to these—the legitimate and principal objects of the work—the author indulges in the enjoyment of the natural history productions of the district. He enters at considerable length upon an interesting detail of the habits of the various land and marine animals which frequent "the Ferry," or are resident in its immediate environs, and likewise gives an account of the vegetable productions of interest, with a reference to their localities. The natural history portion is illustrated by admirable engravings of the birds and fishes, in addition to a profusion of other engravings depicting the various features of interest

about the locality, as well as important objects of antiquarian research. While this work will thus form a most agreeable handbook to all who may only spend even a holiday Saturday in the district, it will, we hope, have the salutary influence of directing the attention of holiday-makers and lovers of rural scenery to the delightful study of natural history, which opens the way for much pure enjoyment to every one who has opportunities of spending a day now and then in the country. The introduction of natural history details into a work such as the present, is a most pleasing sign of the times, and speaks well for the effectual popularising of the subject. Our author weds to an admirable style an extensive knowledge of natural science, and his observations on "things familiar" are calculated to strike the attention of every one. Mr. Fyfe's book likewise embraces details of the important gardens of the neighbourhood, and other interesting gardening information. The following account of the Lentil, and the attempts which have been so successful in its cultivation at Queensferry, by M. Guillerez, may be interesting to many of our readers:--" Queensferry bids fair to become celebrated in the history of our industrial resources, through the introduction by Monsieur Achille François Guillerez of a new field crop into the rotations of Scottish agriculture, founded on the successful acclimatation and culture of the Lentil (Ervum lens) in the open air at Queensferry. The Ervum lens is a legume of the most ancient cultivation, having formed, as expressly stated in Genesis, the mess of pottage for which Esau sold his birthright.\* It has always been extensively used as food in the East. The Arabs account it the species of nourishment best adapted for long journeys through the desert. Certain varieties are, however, esteemed so delicate, as to find access to the tables of luxury; and the food, which for twopence will dine six poor persons sumptuously, is, on the Continent, far from being disdained by the rich. Amongst ourselves, the Revalenta Arabica, Ervalenta, &c., offered as regimen for invalids, is or ought to consist of the flour of Lentils; but these articles are frequently adulterated with the meal of peas, beans, and other legumes. It was when the Potato failure began to excite apprehensions respecting the popular subsistence that M. Guillerez, recollecting the extent to which Lentils are rendered available in France, Germany, &c., began to attempt their introduction for food into this country. He found that, although known as a green crop even three hundred years ago in Britain, beyond a small parcel or so grown scientifically in a nursery, the seed of the Ervum lens had never been ripened amongst us. He therefore introduced from France the seeds of two species in general cultivation, and has for several years in succession matured at Queensferry the prolific produce, both of the larger yellow Lentil and the small brown. It was a pleasant sight to witness the progress of this interesting crop, although growing upon an unfavourable exposure, in close drills, manured only with sea weed, after having been acclimatised, when it manifested great luxuriance. Its foliage is a delicate pea-green, its blossom a minute white flower, thickly studding the fairy-like tracery of its leaves, and its pods very multitudinous—those of the larger description containing generally only one, and those of the smaller or favourite kind always two, small grains or peas. The attention directed to these efforts by the 'Scottish Agricultural Journal' has not proved fruitless, for the subject has been brought before the Highland and Agricultural Society of Scotland, specimens of the produce have been requested [and sent] for the Great Exhibition of 1851, and the matter has been warmly taken up by the press; so that some of our enterprising agriculturists will doubtless follow up the enthusiastic effort of this intelligent French gentleman, by practically adding a new crop to those grown for food in Britain." Pp. 123-5.-L.

Glenny's Golden Rules for Gardeners (Cox).—A book of lessons compressed into short sentences, and consisting of the pith of the author's writings in other publications, with reference to the works in which the more detailed treatises may be found. It thus forms a sort of index to a variety of subjects treated at length elsewhere, chiefly in the Horticultural Magazine; and at the same time an abstract of the more complete papers. Some of the many rules given are really "golden" ones, and may be safely followed: with others we do not quite agree, as for instance, the following:—"Climbing plants should be trained in their places daily; if neglected, they make their growth the wrong way, and never properly recover." However, as the author remarks, "much may be gleaned from it even by the man who believes he knows his business;" and "neither the size nor price will make it one of the great evils of the day."—M.

The Ornamental Flower Garden and Shrubbery (Willis, Covent Garden).—A cheap, well-got-up re-issue of the most striking plates originally published in the later volumes of the Botanical Register and in Sweet's British Flower Garden, with English descriptions, the text being entirely remodelled, and the plates (in the first number now before us) superior in colouring to the original issue. Those who are interested in possessing so useful a series of plates of the most beautiful flowers, should take the opportunity of subscribing. To gardeners and nurserymen it will be a book of utility, while ladies and amateurs will find in it, also, an elegant table-book.—M.

\* A paper on the Lentils of Scripture was published at vol. i. p. 141.

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#### DEUTZIA GRACILIS.

Nat. Order, -PHILADELPHACE.E.

GENERIC CHARACTER. - Deutzia, Thunberg. - Calyx with a bell-shaped tube, adherent to the ovary; limb inferior, fivetoothed. Corolla of five petals inserted beneath a fleshy epigynous disk, alternately with the teeth of the calyx, obovate-oblong, induplicately valvate in æstivation. Stamens ten, inserted with the petals, the alternate ones opposite to the petals, shorter; filaments compressed flat, subulate or shortly three-lobed, the middle lobe bearing the anther; anthers introrse, two-celled, sub-globosely didymous, bursting longitudinally. Ovary inferior, three- or four-celled; orules numerous, on fleshy placentas projecting from the central angles of the cells, imbricated in many rows, ascending; styles three or four, threadlike, erect, at length elongated; stigmas decurrently club-shaped, fleshy. Capsule leathery, the calyx forming a husk, the epigynous disk forming an umbilicus; three- or four-celled, splitting into three or four cocci, the cocci cohering at the base and apex; placentas at length hollow, parting into two longitudinally. Seeds numerous, ascending, imbricated in many rows, oblong,

compressed; the testa membranous, reticulately veined, the base loosely tubular around the hilum, split irregularly, the summit produced into a short wing. Embryo orthotropous in the axis of horny albumen, sub-cylindrically club-shaped; cotyledons very short, obtuse; radicle near the hilum, inferior.—Low shrubs, natives of Upper India and Japan; scabrous with stellate hairs; branches lax, frequently pendulous; leaves opposite, without spots, shortly stalked, simple, crenate, or serrate, stipules absent; flowers in thyrses, showy.—(Endlicher Gen. Plant., 6107.)

Deutzia Gracilis, Zuccarini.—Slender Deutzia.—Leaves acuminated from a wedge-shaped lanceolate or ovate-lanceolate base, sharply serrate, stalked, with very minute stellate hairs scattered over both faces; flowers arranged in simple racemes; lobes of the calyx [acute or] acuminate; filaments three-toothed, anthers glabrous.

SYN.—D. gracilis, Zuccarini in Sieb. Fl. Jap. Planchon in Flore des Serres, t. 611. Morren in La Belg. Hort., t. 54.

ESCRIPTION.—A shrub, growing naturally about 6 to 7 feet high. The branches are clongated, flexible, attenuated, especially the flowering shoots, which are usually pendulous; when young they are slightly angular, from the decurrence of the petioles. Leaves opposite, wedge-shaped-lanceolate or ovate-lanceolate, acuminate, finely dentate at the margins, clothed on both faces, more especially the upper, with very minute stellate hairs; the longest leaves about 1 to  $1\frac{1}{2}$  inch long; the petioles scarcely a quarter of an inch long with a minute scaly bud in the axil. The panicles of flowers are terminal on the branches, simple or rarely divided (only at the bases of the branches); about 12 to 18 flowers in a panicle, the lower opposite or somewhat whorled, the upper usually alternate. The tube of the calyx is urccolate, with ovate-lanceolate teeth, simply pointed, not acuminate in the cultivated plant. Petals obovate-oblong, obtuse, somewhat hooded at the summit, with hairs like those on the leaves on the outer face. Stamens ten, in two rows, three-lobed; anthers ovate, four-celled. Disk five-lobed, rather fleshy. Styles three, persistent, glabrous, threadlike, longer than the stamens. Stigmas thickened at the summit, decurrent laterally upon the style, and covered with minute hairs.—A. H.

HISTORY, &c.—This charming hardy shrub is a native of Japan, and was introduced to Belgium by the indefatigable Dr. Von Siebold, whose importation was, we believe, purchased by M. Joseph Baumann of Ghent, by whom the plant has been exhibited as a novelty during 1850 and 1851, in several of the Belgian cities, as well as at London and Paris,—on each occasion taking the first prize. The same species was produced by Messrs. Veitch of Exeter, at the London May exhibitions of the present year. Our figure was made from specimens communicated by M. Baumann. Deutzia gracilis blooms freely in the spring months.

Though in Japan, according to Siebold, it grows six feet or more high, the cultivated plants have not attained more than a height of from two to two and a half feet, with a natural tendency to become half pendent, a feature which will suggest many ornamental appliances to which the species will be found adapted. Professor Morren remarks that the generic character ought to be modified in respect to the stamens, "which are really neither introrse nor extrorse, for their dehiscence takes place laterally."

CULTURE.—This is one of the most valuable novelties of the season, both for the shrubbery border and for pot cultivation, whether to decorate the conservatory or for cutting for bouquets. Being a slender plant, however, it will be better adapted for pot, or wall culture, than to be grown as an exposed bush. It will grow in any good free loam, well curiched and lightened by decaying vegetable matter, and is increased readily by cuttings. The wood must be properly matured in autumn, to ensure its blooming freely when forced; and by judicious stopping it may be trained into a very graceful and elegant bush.—A.

VOL. III

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#### THE GENERA AND SPECIES OF CULTIVATED FERNS.

BY MR. J. HOULSTON, ROYAL BOTANIC GARDEN, KEW; AND MR. T. MOORE, F.L.S., &c.

Sub-order-Polypodiace. Tribe-Pterider.

Sect. II.—Metasoræ, J. Smith.—From meta, a change, and sorus; alluding to the variable form and position of the sori.

OMARIA, Willdenow (Stegania, R. Brown).—Name derived from loma, an edge or border; in allusion to the marginal position of the indusium.

Fronds of two kinds; the fertile erect, contracted. Sori linear, elongate, continuous, arising from a thick and elevated receptacle, often occupying nearly the whole disk. Indusium linear, vaulted, revolute and conniving, at length replicate and torn, seated on or within the thickened margin. Veins of the sterile fronds, forked; venules direct, free, with their apices club-shaped, and usually terminating within the margin; veins in the fertile segments scarcely evident. Fronds simple pinnatifid or pinnate, from one to two and a half feet long, usually glabrous.—The habit, in which there is great uniformity, is the principal character that distinguishes this genus from Pteris; the fertile fronds being in all cases contracted, with the spore-cases scated on a broad thickened receptacle, and not in any instance on the base of the indusium, as in Pteris. With Blechnum it has undoubtedly a very close affinity; the broad sporangiferous receptacle, which is the primary character that sepa-

rates it from that genus, has considerable analogy to the amorphous receptacle of Acrosticheæ, to which tribe Lomaria forms a transition through Stenochkena. The position of the indusium affords no definite character, for nearly all the species that are in cultivation, if examined in a living state, have the indusium intramarginal, with the veins extending beyond the sporangiferous receptacle. The most obvious character, and that by which they are readily recognised from the rest of the Pterideæ, is the contracted fertile fronds, with a linear continuous sorus. Fig. 42 represents a pinna of the sterile frond, and a portion of the fertile frond of L. onocleoides (nat. size).

1. L. Patersoni, Sprengel.—An evergreen, greenhouse Fern, from Van Diemen's Land. Sterile fronds rigid, simple, often pinnatifid in cultivation, eight or ten inches long, ensiform-lanceolate, dark green, margin crenulate. Fertile fronds linear, narrow, simple, often pinnatifid, one foot high; terminal, adherent to a tufted rhizome.

2. L. lanccolata, Sprengel.—A dwarf evergreen, greenhouse Fern, native of New Zealand and Van Diemen's Land. Sterile fronds glabrous, lanceolate, eight inches long, sub-pinnate, dull green, the segments oblong-obtuse, rigid, repand, with the margin entire. Fertile fronds lanccolate, eight or ten inches high, pinnate; pinuæ linear, acute, repand. Fronds terminal, adherent to a somewhat tufted rhizome.

3. L. alpina, Sprengel (L. antarctica, Carmichael).—A neat dwarf evergreen, frame species, native of Van Diemen's Land, New Zealand, Cape Horn, and the Falkland Islands. Sterile fronds glabrous, lanceolate, four inches long, bright green, pinnate; pinnæ oblong-obtuse, adnate, round at the apex, sub-falcate, margin entire. Fertile fronds, lanceolate, pinnate, six inches high; pinnæ lincar-oblong, sub-falcate. Both forms are lateral, adherent to a creeping rhizome.

4. L. Spicant, Desvaux (Blechnum boreale, Swartz).—An elegant hardy species, indigenous to Britain, and also common throughout Europe, Madeira, and on the North-west coast of America. Sterile fronds glabrous, lanceolate, one foot long, bright

green, reclining, pectinate-pinnatifid; segments lanceolate, rather obtuse. Fertile fronds pinnate, one to one and a half foot high; pinnæ linear-acuminate. Both forms are terminal, adherent to a tufted rhizome.

5. L. nuda, Willdenow (Onoclea nuda, Labillardiere).—A glabrous evergreen greenhouse Fern, from Van Diemen's Land. Sterile fronds broadly lanceolate, pinnate, one to one and a half foot long, light green; pinnæ adnate, oblong-lanceolate. Fertile fronds pinnate; pinnæ curvate, linear acuminate. Both forms are terminal, adherent to a fasciculate creeping rhizome.

6. L. attenuata, Willdenow.—An evergreen stove species, from the Mauritius. Sterile fronds glabrous, lanceolate, pinnate, dull green, one to one and a half foot long; segments adnate, repand, oblong-acuminate, margin entire. Fertile frond pinnate, one foot high; pinnæ linear-acuminate. Fronds terminal or lateral, adherent to a slender somewhat erceping caudex, often erect attaining the height of nearly two feet.

7. L. auriculata, Desvaux.—A glabrous evergreen greenhouse Fern, from the Cape of Good Hope. Sterile fronds lanceolate, pinnate, one and a half foot long, lively green; pinnæ linear-acuminate, sub-imbricate, petio-lulate, slightly falcate, and auriculate at the base. Fertile fronds broadly lanceolate, pinnate; pinnæ linear-acuminate. Both forms are terminal, adherent to a rather erect rhizome.

8. L. alta, R. Heward MS.—An evergreen greenhouse species, a native of New Zealand. Sterile fronds glabrous, two feet and a half long, pinnate, pale green; pinnæ oblique cordate-oblong acute sub-petiolate, the margin serrate. Fertile fronds pinnate, nearly as tall as the sterile ones; pinnæ linear, narrow, four inches long. Rachis and stipes paleaceous. Fronds terminal, adherent to a somewhat creeping rhizome. This plant is figured in Hooker's Icones Itlantarum, t. 427-428, under the name of L. procera.



Fig. 42.

9. L. Gilliesii, Hooker et Greville.—An ornamental evergreen greenhouse Fern, from Brazil. Sterile fronds glabrous, ovate-lanceolate, pinnate, one foot or more long, pale green; pinnæ oblique, oblong-ovate, acute, inferior ones petiolate and somewhat cordate at the base, margin serrate. Fertile fronds pinnate, a foot or more high; pinnæ linear, acute. Stipes scaly; terminal, adherent to an erect fasciculate rhizome.

10. L. magellanica, Desvaux (L. robusta, Carmichael; L. obtasifolia, Presl).—An ornamental evergreen frame or greenhouse species, a native of Tierra del Fuego, the Falklands, and other islands of the Southern Ocean. Sterile fronds ovate-lanceolate, pinnate, a foot or more long, deep green; pinnæ linear-lanceolate, coriaceous, acute, inferior sub-petiolate, superior adnate, decurrent at the base, margin entire. Fertile fronds pinnate, a foot or more high; pinnæ linear, acute. Stipes and rachis scaly; terminal, adherent to an erect rhizome. This species, if at present in cultivation, is very scarce; it was introduced in 1843, along with L. alpina, by Dr. Joseph Hooker, from the Falkland Islands, and is likewise found in Chili, the island of Juan Fernandez, Rio Grande, the Organ Mountains in Brazil, and grows as far north as British Guiana, and on the small island of Tristan d'Acunha to the cast. On the Organ Mountains it produces a thick caudex four feet high, which, with the fronds on the top, have much resemblance to some species of Zamiæ; hence it was called by Gardner, L. zamioides.

11. L. onocleoides, Sprengel.—An evergreen stove fern, from Jamaica, and other West India Islands. Sterile fronds ovate-lanceolate, pinnate, a foot or more long, dull green; pinnæ thick, coriaceous, oblong, rather ovate, undulated, petiolate, somewhat round at the base, mucronate-serrate at the apex. Fertile fronds pinnate, a foot long; pinnæ linear, acute. Rachis and stipes scaly; terminal, adherent to a short creeping rhizome.

12. L. capensis, Willdenow (L. gigantea, Hort.)—A coarse-looking evergreen greenhouse species, from the Cape of Good Hope. Sterile fronds glabrous, pinnate, two to three feet long; pinnæ dark green, linear-lanceolate, six inches long, undulate, cordate at the base, the margin crenulate. Fertile fronds pinnate, three feet long; pinnæ entire, six inches long, linear acuminate. Stipes scaly near the base; terminal, adherent to a thick creeping rhizome. This is not the L. gigantea of Kaulfuss, according to Sprengel's description.

13. L. glandulifera, R. Heward MS.—A robust evergreen stove Fern, from Java. Sterile fronds rather ovate, pinnate, two feet long, deep green; pinnæ oblong-elongate, coriaceous, undulate, slightly cordate at the base, with the apex acuminate and serrate, petiolate, with a gland beneath on the upper side at the base. Costa scaly, stipes paleaceous at the base, with a few narrow scales scattered throughout the rachis. Fronds terminal, adherent to an erect rhizome. Fine specimens of this Fern were distributed among Lobb's Java specimens (No. 274); it has been but recently introduced to English collections from Vienna.

14. L. Fraseri, Allan Cunningham.—An ornamental evergreen greenhouse Fern, from New Zealand. Sterile fronds glabrous, rather ovate, bipinnatifid, fifteen inches long; pinnules lanceolate, segments oblong-linear, acute, the margin dentate. Fertile fronds bipinnatifid, ten inches high, segments linear-oblong. Fronds lateral or terminal, adherent to a somewhat erceping rhizome.

DLECHNUM, Linnaus.—Named from blechnon, one of the Greek names for a Fern.

Sori linear, continuous or sometimes interrupted, costal, rarely medial. Indusium plane, of the same form as the sori, and conniving with the costa. Veins in the sterile fronds forked; venules direct, free; those of the fertile fronds combined near their base, at the point of forking, by a transverse vein forming the sporangiferous receptacle, usually near the midrib. Fronds simple pinnatifid or pinnate, from six inches to five feet long, and generally glabrous.—Some of the noblest and largest growing plants in all Pterideæ belong to this genus. In habit and venation they are similar to Lomaria, but are easily distinguished from them by the fertile fronds not being contracted. They are all natives of tropical or subtropical regions, and are easily cultivated. The great difficulty of constructing artificial characters for the distinction of this race of plants, without forming a multiplicity of genera, is in this case obviously manifest; a linear continuous costal sorus is the true character of the genus, and this is found constant throughout all the species belonging to it that are in cultivation, with one exception, in which the sorus is medial, and often interrupted. Fig. 43 represents the terminal portion of a frond of B. gracile (nat. size).

 B. lanceola, Swartz.—A dwarf evergreen stove Fern, from Brazil. Fronds glabrous, simple, lanceolate, six inches long, deep green. Stipes sealy near the base. Fronds nearly all fertile; terminal, adherent to a creeping rhizome.



2. B. glandulosum, Kaulfuss. -An evergreen stove species, from Brazil. Fronds lanceolate, minutely pubes-

cent, one foot long, pectinate-pinnatifid; segments rather membranous, linear-lanceolate, acute, pale green, and slightly falcate. Stipes scaly near the base; terminal, adherent to a creeping rhizome.

3. B. triangulare, Link.—An evergreen greenhouse species, from Mexico. Fronds glabrous, lanceolate, a foot or more long, deep green, pinnate; pinnæ usually alternate, sessile, oblong-acuminate, slightly falcate, inferior ones distant, terminal one entire, and caudate. Stipes scaly; terminal, adherent to a creeping rhizome.

4. B. brasiliensis, Desvaux (B. corcovadense, Raddi).—A large-growing evergreen stove species, from Brazil. Fronds lanceolate, four to five feet long, pinnate, deep green; pinnæ adnate decurrent, rigid, repand, linear-lanceolate, oblique, 7—8 inches long, undulated, margin spinulose-serrate. Stipes 2—3 inches long, scaly; terminal, adherent to an erect caudex, attaining the height of two feet or more.

5. B. australe, Linnæus? (B. pectinatum, Hort.)—A very elegant evergreen greenhouse species, from the Cape of Good Hope. Fronds slender, lanceolate, light green, one foot long, pinnate; pinnæ rather membranous, sessile, slightly falcate, linear-lanceolate, lower ones standing forward, distant, sub-auriculate on the superior base; the terminal one entire and caudate. Rachis pubescent; stipes reddish, with a few scattered scales at the base; terminal, adherent to a creeping rhizome.

6. B. cartilagineum, Swartz.—An ornamental evergreen stove or greenhouse species, from New South Wales. Fronds broadly lanceolate, pinnate, three feet long, light green; pinnæ sessile, with a dilated base, linear-lanceolate, oblique, eight inches long, undulate, the apex mucronate, spinulose-serrate at the margin. Stipes about six inches long, muricated, and densely covered with narrow dark scales. Fronds terminal, adherent to a thick creeping rhizome.

7. B. occidentale, Linnaus.—An ornamental evergreen stove Fern, from the West Indies and Brazil. Fronds lanceolate, pinnate, a foot or more long, of a lively green; pinnæ sub-sessile, falcate, subcordate-lanceolate, lower ones distant; terminal one entire and caudate, acute, with small spinulose teeth on the margin. Rachis glandulose-pubescent. Stipes scaly near the base; terminal, adherent to a creeping rhizome.

8. B. hastatum, Kaulfuss (B. trilobum, Prest).—A glabrous evergreen greenhouse Fern, from Chili. Fronds lanceolate, a foot or more long, light green, pinnate; pinnæ linear-lanceolate, acute, falcate, inferior hastate, petiolulate, superior sessile, auriculate at the base. Stipes scaly at the base; terminal, adherent to a creeping rhizome. Sori linear, continuous or interrupted, medial. Indusium fringed on the margin.

9. B. intermedium, Link (B. longifolium, Humboldt).—A dwarf evergreen stove species, from Brazil. Fronds glabrous, six or eight inches long, pinnate, light green; pinnæ oblong-ovate obtuse, terminal one large and clongate, lower petiolulate, upper adnate. Rachis and stipes reddish, with a few scales near the base; terminal, adherent to a creeping rhizome. This little plant has only two pairs of pinnæ on each frond, and the terminal one is about four inches long.

10. B. gracile, Kaulfuss.—A graceful evergreen stove Fern, from Brazil. Fronds glabrous, slender, pinnate, dark green, a foot or more long; pinnæ lanceolate, sub-falcate, inferior petiolulate, superior adnate, terminal one elongate. Rachis and stipes reddish, with a few scales near the base; terminal, adherent to a creeping rhizome.

11. B. serrulatum, Richard (B. angustifolium, Willdenow).—A beautiful evergreen stove Fern, from the Mauritius. Fronds glabrous, pinnate, two feet long, bright green; pinuæ rather membranous, lanceolate, petiolate, obliquely truncate at the base, with a cartilaginous serrated margin, articulate with the rachis, and having a few small cordate scales on the costa;

OODIA, R. Brown.—Name commemorative of Samuel Doody, a London apothecary, and the first British cryptogamist.

terminal, adherent to a peculiar elongated creeping rhizome.

Sori oblong, straight or arcuate, transversely uniserial or biserial, produced on the transverse anastomosing, or arcuate venules. Indusium plane, of the same form as the sori. Veins forked; venules arcuately anastomosing near their base, where they are generally soriferous; then direct and free towards the margin. Fronds pinnatifid or pinnate, from eight to eighteen inches long, rigid, uniform, or the fertile ones contracted, margin spinulose.—The few species on which this genus is established are of a very rugose nature, and are natives of New Holland, New Zealand, and the Sandwich Islands. The uniformity of aspect, habit, and venation developed throughout the species that are in cultivation is so great, that these are expressive characters of the genus, even in the absence of fructification. Their nearest affinity is with Woodwardia, from which they are principally distinguished by having a more superficial sorus and simple venation. Fig. 44 represents a small portion of a frond of D. blechnoides (nat. size).

1. D. caudata, R. Brown (D. rupestris, Kaulfuss).—A pretty little evergreen greenhouse Fern, from New South Wales and Van Diemen's Land Fronds of two kinds. Sterile linear-oblong, glabrous, pinnate, six inches long; pinnæ oblong-obtuse, inferior petiolate, superior adnate, margin spinu-

Fig. 44.

lose-serrate. Fertile contracted, glabrous, linear-lanceolate, six to eight inches high, pinnate; pinnæ linear,





bluntly acuminate, terminal one caudate. Fronds of a light green; terminal, adherent to a somewhat creeping rhizome. This is one of the commonest Ferns in cultivation, propagating itself freely by its sporules, and thriving in almost any situation, often becoming a pest in the stoves.

2. D. media, R. Brown (D. lunulata, R. Br. MS.).—A very graceful evergreen greenhouse Fern, from New Holland, New Zealand, and Norfolk Island. Fronds slender, narrow-lanceolate, one to one and a half foot long, pendulous, dull green, except when young, then red, pinnate; pinnæ rugose, rigid, oblong-obtuse, inferior ones petiolate, cordate-auriculate, superior sessile, margin spinulose-serrate. Sori uniserial or biserial. Stipes scaly near the base; terminal, adherent to a somewhat creeping rhizome.

3. D. aspera, R. Brown.-A stiff-growing evergreen greenhouse Fern, from New South Wales. lanceolate, rigid, pinnatifid, ten inches high, dull green; segments linear-acuminate, sub-falcate, the margin spinulose-serrate. Suri uniserial or biserial. Stipes scaly; terminal, adherent to a somewhat creeping rhizome.

4. D. blechnoides, Allan Cunningham (D. maxima, J. Smith in Loud. Hort. Brit.) - An ornamental evergreen greenhouse species, from New South Wales. Fronds rigid, broadly lanceolate, one to one and a half foot long, dull green, pinnatifid; segments approximating, lanceolate, repand, the margin spinulose-serrate. Sori uniserial, Stipes densely covered with black scales; terminal, adherent to an erect fasciculate rhizome.

WIJOODWARDIA, Smith.—Name commemorative of Thomas Jenkinson Woodward, an English botanist.

Sori oblong, or linear elongated unisorial immercal results. Sori oblong, or linear elongated, uniserial, immersed, produced on the transverse costal venules. Indusium revolute, vaulted, of the same form as the sori. Veins reticulated, becoming free near the margin, Fronds pinnate, from one to six feet long. Rhizome creeping.—The dissimilarity in habit and venation, of the

few cultivated species arranged under this genus, as compared with other genera, forms a striking peculiarity. In the habit and formation of the fronds, one species resembles a Lomaria; the venation of another is identical with that of Doodia; and a third is a large coarse-growing plant, with fronds five or six feet long, and viviparous near the apex. The position of the sori is the fundamental character that unites them in one group. They are very closely allied to Doodia, from which they are distinguished by the sori being deeply immersed, with a revolute, vaulted indusium, and a more compound anastomosing venation. Fig. 45 represents a portion of a pinna of W. radicans (nat. size).

1. W. radicans, Swartz.-A large coarse-growing evergreen greenhouse species, from Madeira, the South of Europe, Canaries, Nepal, and North West America. Fronds pinnate, five or six feet long, bright green; pinnæ oblong-lanceolate, one foot long; lower ones standing forward, deeply pinnatifid, petiolate, segments somewhat lanceolate, repand, the apex mucronate, the margin spinulose-serrate. Stipes densely covered with very large brown scales. Fronds terminal; adherent, rooting at the apex. Rhizome creeping.

2. W. onocleoides, Willdenow (W. floridana, Schkuhr.) - A hardy deciduous Fern from North America. Fronds of two kinds: the sterile glabrous, pinnatifid, one foot long, pale green; segments ovate-lanceolate, margin serrate. The fertile erect, fifteen inches high, pinnatifid; segments linear-acuminate, narrow. Fronds lateral, adherent to a creeping rhizome.



3. W. virginica, Swartz .- An ornamental hardy deciduous Fern, from North America. Fronds glabrous, ovate-lanceolate, pinnate, light green, one and a half to two feet high; pinnæ lanceolate, pinnatifid, petiolulate, and articulate with the rachis; segments oblong-ovate, rather obtuse, the margin entire. Fronds lateral, on a creeping rhizome.

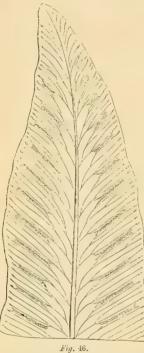
#### Sub-order - Polypodiacem: Tribe-Asplenie.E.

This very distinct and well-marked tribe contains more than two hundred described species, nearly the whole of which were originally comprehended under the two genera, Diplazium and Asplenium; but according to the modern classification they are subdivided into about ten. Their most obvious distinction, and that by which they are easily re-ognized, is the unilateral, oblique, oblong or clongated sori. From the Pterideæ they are distinguished by the position of the sori, which is always oblique in reference to the midrib or axis of venation, never parallel with either midrib or margin; and by the spore-cases being attached on the superior or inferior sides (unilateral), or on both sides (bilateral), of free or anastomosing venules, constituting linear or binate sori, each furnished with a special, laterally-attached, linear, plane or vaulted indusium.

CICOLOPENDRIUM, Smith .- Named from Scolopendru, a centipede; alluding to the lines of fructification, which are thought to resemble its feet.

Sori linear, unilateral, confluent in pairs, produced on the proximate sides of the superior and inferior branch of each fascicle of veins. Indusium of the same form as the sori, with the free margins of each pair conniving,

forming as it were but one sorus, opening by a longitudinal suture, each being attached to the proximate sides of two proximate venules. Veins forked; venules parallel, direct, free, terminating within the margin, and having a club-shaped apex. Fronds simple, linear-lanceolate, plane undulated or divided at the apex, and cordate at the base.-No exotic species of this genus is at present in cultivation, and but three or four are known. That by which it is represented in our gardens is an indigenous species, of which there are a few varieties, all dwarf, handsome, shining evergreen plants. The genus is distinguished from Asplenium by the sori being in pairs, and although in an early stage quite distinct, as two separate sori, yet before they are far advanced they invariably become confluent. Fig. 46 represents the apex of a frond of S. vulgare (nat. size.)



1. S. vulgare, Symons (S. officinarum, Swartz) .- A very beautiful hardy evergreen Fern, indigenous to Britain; found more or less distributed throughout Europe, and also occurring in North America. Fronds glabrous, simple, a foot or more long, shining, bright green, oblong-ligulate, acute, cordate at the base, entire at the margin. Stipes and rachis scaly; terminal, adherent to a somewhat creeping rhizome. Sori linear occupying three-fourths of the under

- S. vulgare & polyschides. - Fronds simple or irregularly pinnatifid, about a foot long, narrow oblong-linear, sinuated, or irregularly and often deeply lobed, with the segments somewhat overlapping each other. Sori oblong or linear, very irregular, occupying three-fourths of the under surface, and situated in the sinus, or on the lobes. A very distinct variety, not very common in cultivation. The late Mr. D. Cameron informed us that he had found it near Bristol.

— S. vulgare γ undulatum. — Fronds simple, oblong-ligulate, acute, about a foot long, sometimes divided at the apex, very much undulated or plaited, and crenate on the margin. The handsomest of all the

forms; the fronds growing somewhat erect, and forming a close compact tuft; they are generally destitute of fructification.

- S. vulgare, δ multifidum. - Fronds oblong, about a foot long, cordate at the base, entire at the margin, divided in a multifid manner at the apex; often divided near the base into many branches, the apex of each branch multifid and tasselled, frequently pendulous. Sori linear occupying the upper half of the frond, and the whole of the ramifications. Sometimes the stipes is forked, and then it becomes what is called ramosum. A less compound division, in which the fronds are lobed only, and not tasselled, is called lobatum. They are scarcely distinct.

A very singular form, intermediate between the vars.  $\beta$  and  $\gamma$ , communicated by Sir W. C. Trevelyan, and found near Nettlecombe, in Somersetshire, is remarkable in having two prominent longitudinal ridges on the under surface, one on each side the midrib and near to the margin, the sori being exterior to them. The ridge is sometimes lobed and soriferous.

These varieties, although originally found wild, are now better known as cultivated plants.

IPLAZIUM, Swartz.—Name derived from diplazo, to double; from the circumstance of two separate sori being placed back to back on a single veinlet.



Sori linear, elongated, produced on both sides of the veinlets, constituting binate sori. All, or the lower veinlets only, soriferous on both sides; the superior ones often producing simple linear sori, similar to Asplenium. Indusium generally plane, and of the same form as the sori. Veins forked or pinnate; veinlets direct, free. Fronds simple, pinnate or bi-tri-pinnate, from one to eight feet long, usually glabrous.—The technical character

of this genus, as pointed out by Swartz, holds good to a greater or less extent throughout all the species here enumerated; yet there are several of them with only one double or binate sorus, which occupies the lower exterior venule; many of the pinnæ often have all their sori simple. Diplazium thus gradually merges into Asplenium, although, in regard to the sori, its nearest affinity is with Callipteris, from which it can only be distinguished by the latter having an anastomosing venation. Fig. 47 represents a frond of *D. plantagineum* (med. size).

1. D. plantagineum, Swartz.—A dwarf evergreen stove Fern, native of Brazil and the West Indies. Fronds simple, glabrous, about a foot long, deep green, rather ovate or oblong acuminate, undulate, proliferous at the base, crenate-serrate at the margin. Stipes with a few scales near the base. Fronds nearly all fertile through-

out; terminal, adherent to an erect fasciculate rhizome.

2. D. juglandifolium, Swartz.—A handsome evergreen stove species, native of Tropical America. Fronds lanceolate, pinnate, from three to five feet long, bright green, glabrous throughout; pinnæ large oblong-ovate, acuminate, somewhat round or truncate-cuneate at the base, slightly crenate-serrate at the margin; inferior petiolulate, superior sub-petiolate. Fronds terminal, adherent to a thick erect rhizome.

3. D. sylvaticum, J. H.—An ornamental evergreen stove Fern, from Ceylon. Fronds broadly lanceolate, glabrous, pinnate, two to three feet long, deep green; pinnæ linear, narrow, acuminate, often ten inches long, petiolulate, sub-cordate at the base, obtusely crenate or slightly pinnatifid, with round obtuse serrate segments.

Stipes scattered over with dark scales; terminal, adherent to a fasciculate erect rhizome.

4. D. Shepherdi, Presl (Asplenium ambiguum, Hort).—A beautiful evergreen stove Fern, native of Brazil, Jamaica, and other West India Islands. Fronds glabrous, somewhat ovate acuminate, pinnate, one and a half foot long, bright green; pinnæ ovate-lanceolate, cuspidate, inferior ones petiolulate, superior sub-sessile, pinnatifid, truncate-cuneate at the base, with oblong-obtuse blunt dentate segments. Fronds terminal, adherent to an creet fasciculate rhizome.

5. D. coarctatum, Link.—A glabrous evergreen stove species, from Brazil. Fronds lanceolate, one and a half foot long, pinnate, deep green; pinnæ oblong-obtuse, acute, lower ones petiolate, sub-bipartite, auriculate on the superior base, inferior obliquely truncate, margin serrate. Stipes scaly near the base; terminal, adherent to an erect rhizome. In some stages this is not very distinct from the subsequent one; but is known by the pinnæ being broader, more closely set on the rachis, and less divided.

6. D. Otites, J. H. (Asplenium Otites, Link; A. bipartitum, Willdenow; Hort. Brit.)—A glabrous evergreen stove Fern, from Brazil. Fronds slender lanceolate, one to one and a half foot long, pinnate, bright green; pinnæ oblong, acute or acuminate, inferior ones bipartite, sometimes sub-bipinnate, petiolate, superior auriculate, truncate-cuncate at the base, margin incised serrate. Stipes scaly near the base; terminal, adherent to an erect

rhizome.

7. D. decussatum, J. Smith (Asplenium decussatum, Wallich).—A very coarse free-growing evergreen stove Fern, from Nepal. Fronds rather ovate-lanceolate, pubescent, two to two and a half feet long, dull green, pinnate; pinnæ lanceolate, petiolulate, sub-cordate at the base, deeply pinnatifid with oblong-obtuse rounded crenate segments, lower ones distant. Stipes and rachis dark coloured. Indusium fringed on the margin. Fronds terminal, adherent to a slender creeping rhizome.

8. D. thelypteroides, Presl (Asplenium thelypteroides, Michaux).—A rather coarse-looking hardy deciduous Fern, from North America. Fronds lanceolate, pinnate, two feet long, dull green, and scattered over beneath with narrow scaly hairs; pinnæ lanceolate, sub-sessile, deeply pinnatifid, with oblong segments rounded at the apex, crenately serrate at the margin. Stipes scaly at the base; terminal, adherent to a thick creeping rhizome. Some fronds in this species have their sori all simple, similar to an Asplenium. Indusium vaulted, and dentate

on the margin.

9. D. arborescens, Swartz.—An ornamental evergreen warm greenhouse species, from St. Helena. Fronds glabrous, rather ovate-lanceolate, three feet long, light green, bipinnate below, above bipinnatifid; pinnæ lanceolate; segments oblong-obtuse rounded at the apex, and serrate at the margin. Rachis and stipes scaly; terminal, adherent to an erect rhizome.

10. D. striatum, Presl (Asplenium striatum, Limacus).—A large-growing evergreen stove Fern, from Jamaica. Fronds bipinnate, three to five feet long, light green; pinna lanceolate, a foot or more long; pinnules oblong-acuminate, sub-cordate at the base, with roundish obtuse dentate segments. Rachis, midrib of pinnae, and pinnules, pubescent. Stipes scaly at the base; terminal, adherent to an erect rhizome, attaining the height of a foot or more.

11. D. sub-alatron, R. Heward MS.—An ornamental evergreen stove Fern, native of Venezuela, Brazil, and other tropical parts of America. Fronds glabrous, bipinnatifid, sub-tripinnatifid below, light green, three to five feet long; pinnules lanceolate, petiolate, deeply pinnatifid, cordate at the base, with oblong-obtuse segments, broad at the apex, and serrate at the margin. Rachis, midrib of pinnae, and pinnules channeled. Fronds terminal, adherent to an erect rhizome, attaining the height of two feet.

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## NOTES, CULTURAL, CRITICAL, AND SUGGESTIVE.

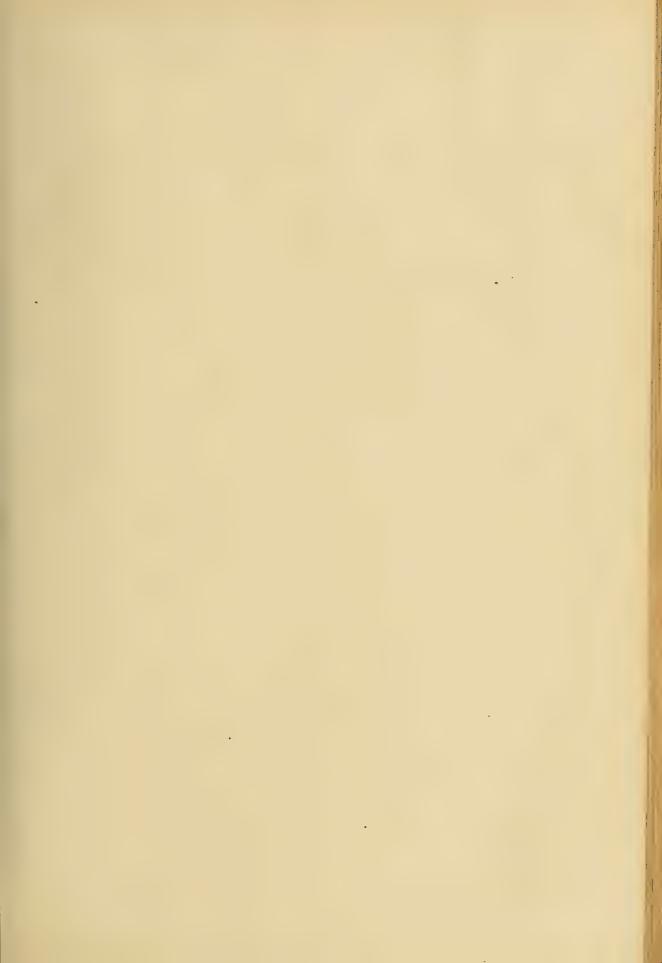
Meudon Pine Culture.—The following are the details of this mode of culture:—The suckers are potted in four-inch pots in August or September, the earliest period after the fruit is cut being preferred, and in these four-inch pots they remain till spring. In March or April following a bed is prepared, half dung and half leaves, and covered with ten inches of peat soil, and into this the rooted suckers, turned out of the four-inch pots, are all planted for the summer. In October the plants are carefully taken up with a little soil at their roots, which are not at all cut, and potted into seven-inch pots, in which they remain during the winter. In the following spring, about March, when the plants show fruit, a number of the strongest are selected for the purpose of being turned out of the seven-inch pots, and finally planted, free, in a bed of peat soil, in houses, where they remain to ripen their fruit in the course of the season. The remainder, not so planted out, are fruited without being shifted out of the seven-inch pots. Beds of half dung and half leaves are prepared about March, and when the heat has been properly regulated the plants are plunged, and there in the seven-inch pots they are fruited. It thus appears that the plants are always in pots in winter. The suckers are in small pots the first winter. The plants are turned out into peat soil, free, during the first summer. All are repotted into seven-inch pots, and so kept during the second winter. In the second summer the strongest are planted out of the pots into peat soil for fruiting, and the remainder are fruited in the seven-inch pots, plunged in beds of dung and leaves,-R. Thompson in Jour. Hort. Soc.

Distribution of Islands in a Lake.—The distribution of islands in a lake or pond requires some judgment; they will always appear more natural when sufficiently near the shore, on either side, to maintain in appearance some connection with it. Although islands do sometimes occur near the middle of natural lakes, yet the effect is by no means good, as it not only breaks and distracts the effect of the whole expanse by dividing it into two distinct parts, but it always indicates a shallowness or want of depth where the water should be deepest. There are two situations where it is universally admitted that islands may be happily introduced. These are at the inlet and the exit of the body of water. In many cases where the stream which supplies the lake is not remarkable for size, and will add nothing to the appearance of the whole view from the usual points of sight, it may be concealed by an island or small group of islands, placed at some little distance in front of it. The head or dam of a lake, too, is often necessarily so formal and abrupt, that it is difficult to make it appear natural and in good keeping with the rest of the margin. The introduction of an island or two, placed near the main shore on either side, and projecting as far as possible before the dam, will greatly diminish this disagreeable formality, particularly if well clothed with a rich tuft of shrubs and overhanging bushes. Except in these two instances, islands should be generally placed opposite the salient points of the banks, or near those places where small breaks or promontories run out into the water. In such situations they will increase the irregularity of the outline and lend it additional spirit and animati on Should they, on the other hand, be seated in or near the marginal curves and indentations, they will only serve to clog up the recesses; and, while their own figures are lost in these little bays, where they are hidden, by lessening the already existing irregularities they will render the whole outline tame and spiritless.—Downing's Landscape Gardening.

Quince Marmalade.—This should be made with ripe fruit; let them hang on the tree till one falls to the ground, then gather the crop. Pare, quarter, and core them; but scrupulously save every pip. The pips of Quinces abound in mucilage, as may be perceived by taking one into the mouth and chewing it, when it will make the lips stick together as a piece of gum arabic would. Put the Quinces with the pips into a stew-pan, with a sufficiency of lump-sugar, and just enough water at the bottom to keep them from burning. As the sugar dissolves and the liquor boils, continue stirring the whole mass. When the fruit becomes tender, break and mash it well with a spoon. In about an hour from the commencement of the operation, it will be done enough. It may then be turned out into preserve jars; a portion should be put into shapes, to be used at dessert in the same way as Bullace and Damson cheese. The next morning it ought to be perfectly stiff and gelatinous, from the strong mucilage of the pips having been thoroughly incorporated with the whole mass. The quantity of sugar used may be rather less than is necessary for other preserves. If tied down the usual way it will keep good for a long time. The medicinal qualities of this preparation are applicable to those cases in which mucilage is administered internally; and a pot of Quince marmalade would be as agreeable a prescription to a dysuretic patient as a dish of roasted Onions, or a dose of Linseed jelly.

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Allamanda Sinotta

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#### ALLAMANDA SCHOTTII.

Nat. Order. -- APOCYNACEE.

Generic Character.—Allamanda, Linnæus.—Calyx five-parted. Corolla hypogynous, funnel-shaped, the tube cylindrical, the throat furnished with five ciliated scales, the limb bell-shaped, large, with five obtuse slightly unequal lobes. Stamens five, inserted in the throat of the corolla, included; anthers arrow-shaped, sub-sessile, connivent. Ovary one-celled, compressed. Ocules numerous on a placenta surrounding the margins, pendulous from a longish funiculus. Capsule leathery, roundish-elliptical, lenticular-compressed, spiny, one-celled, longitudinally two-valved. Seeds numerous, attached by a vertical funiculus, pendulous from the margins of the valves, at length imbricated, rather compressed, surrounded by a broad membranous wing. Embryo straight, within spiny cartilaginous albumen; cotyledons foliaceous, ovate-cordate,

radicle linear-acuminate, centrifugal.—Erect or climbing shrubs or under-shrubs from tropical America; leaves in whorls; peduncles terminal and interpetiolar many-flowered, flowers showy, yellow.—(Endlicher Gen. Plant., t. 3383.)

ALLMANDA SCHOTTH, Pohl.—Schott's Allamanda.—Branches slightly hairy; leaves ternate or quaternate, oblong, acuminate, narrowed at the base, sessile, glabrous, glands minute, acute; peduncles and calyxes glabrous; lobes of the calyx lanceolate acuminate; the funnel-shaped throat of the corolla longer than the constricted part of the tube; lobes rounded, obliquely one-toothed.

Syn.—All. Schottii, Pohl, brasil., fig. 58. A. brasiliensis, Schott.; A. cathartica, Schräder in Gött. Anz.; A. neriifolia of the gardens.

ESCRIPTION.—A stiff erect shrub with stout branches, very slightly hairy; the leaves in threes and fours, or occasionally opposite above; oblong-lanceolate, acuminated at the upper end, narrowed at the base, sessile, glabrous above, but with hairs on the veins beneath; glands minute, acute. Peduncles and calyxes almost glabrous. Lobes of the calyx lanceolate, acuminate. The funnel-shaped throat of the corolla longer than the narrow tube, lobes rounded, oblique, with one tooth near the summit.

History, &c.—The present plant appears undoubtedly the A. Schottii of Pohl, but is different from the plant figured under that name in the Botanical Magazine (4351). Our plant is more shrub-like in its habit of growth, the leaves appear rather broader, more lanceolate; the flowers are much smaller, but they agree more closely with the original description, in the comparative lengths of the throat and narrow tube. Several plants have been sent to us under different names to assist in the elucidation of the species of this genus, but we cannot at present give the results of our observations, since they are imperfect. It may be mentioned, however, that of the Allamandas shown at the July fete of the Royal Botanic Society this year, that sent us as "A. Schottii, from Mr. Pince," was the A. Aubletii of the Botanical Magazine, synonymous, according to De Candolle, with A. cathartica of Linnæus and Linnæi of Pohl; a plant called A. cathartica, stated to be commonly shown as Aubletii, was the same. The "A. Schottii from Mr. Henderson" was the A. Schottii of the Botanical Magazine, which appears to us to be merely a variety of Pohl's plant. A. Aubletii is readily known by its obovate and suddenly acuminate leaves. The plant shown as A. grandiflora is quite distinct.—A. H.

Our figure was made from a beautiful specimen communicated by Messrs. Lucombe, Pince, & Co., of the Exeter Nursery. The plant is remarkably free in producing its flowers, blooming onwards for several months, which compensates for the comparative smallness of the flowers, and renders it a most desirable addition to our stove shrubs. We hope shortly to be able to explain Mr. Pince's mode of culture, which must have been most successful, as was indeed evident from the fine specimen sent to us, and to which the size of our plate scarcely allows us to do justice. We may add that, although Mr. Henfrey identifies in this A. neriifolia of the gardens, the true A. Schottii of Pohl, and considers that figured by Sir W. Hooker, under the name of A. Schottii in the Botanical Magazine, as a probable variety in a botanical sense, the two plants are perfectly distinct for all garden purposes, ours having much smaller flowers, more copiously and continuedly produced, and an entirely different habit from Sir W. Hooker's plant, fine samples of which have also been sent to us from the Exeter nursery. With the exception of A. grandiflora the present is the most distinct of all the forms in cultivation.—M.

CULTURE.—Few families of stove plants are more deserving of extensive cultivation than the one under notice, for, though the flowers are mostly of a colour, they are so noble that every person must admire them. Our present subject emanated from the continent, being first brought into notice by Mr. E. G. Henderson of the Wellington Road Nursery, and it is remarkable as flowering profusely in a very dwarf state, and, with proper heat, throughout the

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entire winter. It is generally known as A. neriifolia, but we find it identical with A. Schottii and the plant so called in the nurseries is probably a variety of it. In cultivation it is found more delicate than the other species, but still it is by no means a bad grower. Those, however, who wish to get strong plants in a short time, should work or graft it upon a strong young plant of A. cathartica, and, so managed, it will be found to grow very splendidly. The best time to graft Allamandas is in the autumn; but if they are in vigorous condition and the growth tolerably mature, they may, (other things, that is, heat and moisture, being suitable,) be worked at any time.

The Allamandas may also be readily propagated by cuttings, and by single eyes with a leaf or part of a leaf attached. These should be taken off when the wood is pretty firm, as, if it is young and soft, they are liable to damp. When the cuttings are put in, which they must be in silver sand, plunge the pot into a brisk bottom heat of eighty degrees, and cover with a hand or bell glass. The cuttings will strike root in about six weeks and then they must be potted off singly, and be nursed in a moist warm atmosphere until they are properly established. Now, in selecting plants to grow into fine specimens, it is necessary that they be dwarf and strong, so that four or five strong shoots may be produced from near the base of the plant, to form the foundation of a good specimen. Such a plant may in February be moved from a four inch to a six inch pot, using a compost composed of good turfy loam, peat, and thoroughly decayed cowdung, in about equal proportions, liberally intermixed with sand, and charcoal in small pieces. The shoots must be shortened in, and the plant must be kept in a brisk growing temperature, and if with a gentle bottom heat it will be all the better. The young shoots must be allowed to grow wild until they show bloom, for it is found that if they are trained they rarely produce flowers so soon or so profusely as when allowed to grow unrestrictedly. the plants as they require it, using the same compost, and when the pots are full of roots water liberally with liquid manure. It is scarcely necessary to remark that the usual stove treatment as to syringing must be observed. Plants thus managed will produce an abundance of flowers in the autumn, but towards October they must be comparatively dried off, and be kept in a dormant state through the winter. In the second and all succeeding seasons spur the plants well in at the time of starting them, and shake the soil from the roots and repot the plants when they have made young growth an inch or two long. If it is possible so to reduce the ball as to get the plant into a smaller pot, so as to admit of a shift later in the season, it will be an advantage, and the flowers will be produced much finer in consequence; but, if such treatment cannot be managed, liquid manure must be liberally supplied, especially as the plants come into flower, and it may be well to top-dress the pot with fresh cow and sheeps' dung in equal proportions. The Allamandas are gross-feeding plants, and will amply repay any extra care that may be devoted to them. Beautiful, however, as Allamandas are when properly managed in pots, it is when planted out and permitted to cover a considerable space that they are seen in full glory. In the garden of Sir George Staunton there is a plant of A. cathartica which covers the end of the tropical plant stove, and for many months in the year thousands of flowers may be seen open at one time. This plant is in a border in which its roots have to do battle with those of Ficus elastica, and consequently it does not grow very robustly, but the profuseness with which it produces flowers is quite astonishing. The roots are much restricted for space, but still the plant flowers very profusely, though the flowers are comparatively small. In planting the Allamanda out we should recommend the roots to be confined to about a cube yard of soil, and, if a little bottom heat could be afforded it so much the better; indeed the corner of a tan bed appears a very suitable site, and there, with the branches trained at full length and the roots curtailed a little annually, no doubt the plants would flower profusely. Room, however, is what they want, and room for the branches they must have. Our present subject, A. Schottii, does not grow so rampantly as some of the other kinds, and, consequently, is better adapted for pot cultivation, and in another season we have no doubt it will be shown in firstrate condition.—A.

A. T.

## ON RAIN, AND THE CONSTRUCTION OF RAIN GAUGES.

By E. J. LOWE, Esq., F.R.A.S., M.B.M.S., &c.

MONGST the many useful enquiries that claim the attention of the practical gardener, that of the amount of rain is an important one; it is so various in different localities, and indeed in the same locality at different periods, that a more intimate knowledge is highly desirable, not only for the welfare of the out-door plants, but in the construction of cisterns for the supply of water for the greenhouse or the stove.

The instrument by which we measure the rain-fall is easily constructed, and as such, should be more widely spread. The best form is that of a cylindrical vessel of brass or zinc; the latter would be the cheapest, and answers all purposes equally well. Into this cylinder, a funnel, with its tube bent, fits tightly; the diameter should be eight inches, and the tube about an inch in length. The object of this bended tube is to prevent evaporation taking place from the surface of rain collected in the rain gauge, for a few drops of water will hermetically seal the opening from the escape

of vapour, and most frequently the evening dews will deposit sufficient moisture for this purpose, which the heat of the day will scarcely have time to dissipate before night brings a fresh supply.



Fig. 1

The readiest mode of measuring the amount deposited in the gauge is by procuring another cylindrical vessel, or measure, which is exactly four inches in diameter, and four inches deep: this, when quite full, will just contain an amount equal to the deposit of an inch of rain as collected in the eightinch gauge. Parts of an inch can be measured by plunging a rule (fig. 2) perpendicularly to the bottom of the measure, the portion wetted by the water being the decimal part of an inch required. Thus, having made a rule exactly four inches in length, and divided it into ten equal parts, and each division being subdivided into ten others, a measure is obtained which will read off to a hundredth of an inch, and as the divisions are tolerably wide, it is not difficult to estimate even to thousandths of an inch. Thus, for example, as used in the measure, the rule four inches long, divided into 100 parts, represents one inch of rain fallen; the score at twenty-five, or one inch, represents a fall of a quarter of an inch, and so on.

The mean annual amount of rain which falls in England is rather more than thirty inches in round numbers, but this is very different, as before stated, in different localities. At Newcastle-on-Tyne, it is 17.6 inches; at Felthorp (Norfolk), 22.6 inches; at Boston, 23.1 inches; at Edinburgh, 25.6 inches; at Highfield House (Nottingham), 27 inches; whilst in the lake district of Westmoreland at Grasmere, it is 107.5 inches; at Gatesgarth, 117.2 inches; at Sparkling Tarn, 124 inches; and at Scathwaite, 140.6 inches.

With regard to the different amounts which have fallen at the same places in different years, the following brief table will afford sufficient illustration:—

At Edinburgh, in	1827,	the amount fallen was	s 32·6	in.,	in	1826	it was only	15:3	in.
At Highfield House, in	1848,	21	38.5	37	in	1844	"	20.1	"
At Rochdale, in	1836,	23	61.1	22	in	1844	11	34.4	11
At Liverpool, in	1841,	,,	49.5	3.7	in	1826	11	22.2	,,
At Goodamore (Devon), in	1839,	21	70.1	33	in	1844	19	41.6	13
At Keswick, in	1846,	,,	74.3	"	in	1847	>>	47.0	"

In Cornwall and Devonshire the greatest amount of rain falls in winter, whilst in the remaining counties of England, excepting in the north (where this law is variable), the most occurs in summer. At Keswick, Styhead, Sparkling Tarn, Applegarth, and Glencorse, it is greatest in summer; at Grasmere, Scathwaite, Gutesgarth, Gilmorton, and Glasgow, it is greatest in winter; and at Great Gable, and Newcastle-on-Tyne, it is greatest in spring.

Fig. 2. The amount of rain which fell between 9 a.m. and 10 p.m. at Highfield House, in 1850, is 12.9 inches, or about an inch for each hour; the amount fallen between 10 p.m. and



9 a.m., in the same year, is 7.8 inches, or 0.7 inch per hour, which shows an excess of 3-10ths in the day, over that of the night hours.

It is urged upon those who wish to record the rain-fall, to place a gauge near the surface of the soil, and another some few, or more feet, above the ground. As an illustration of the importance of this step, it may be mentioned that in 1850, at Highfield House, near the surface of the ground, 22·1 inches fell, whilst at 25 feet above the ground only 20·7 inches fell. In a violent thunderstorm, which only lasted an hour, I registered 1·00 inch at 25 feet, and 1·10 inch on the ground. This increase is greatest in hot weather, and the law is not confined to rain, as it applies equally to snow and hail. In summer the rain drops increase in size very rapidly as they near the earth, whilst in winter but little, and frequently no alteration in their bulk takes place. At a temperature of 25°, if snow falls, the flakes are exceedingly small, but as the temperature nears that of the freezing point, they become rapidly larger. In like manner, in winter the hailstones are small, but in the summer months, and more especially during thunderstorms, they attain a size which is so much dreaded, and occasionally produces sad havoc to our houses with glass roofs.

# Garden Vints for Amateurs.

AUGUST.

NCE more we are approaching "the sere and yellow leaf;" and gay as our gardens may appear at the present time, the cold nights of the harvest moon will soon begin to spread desolation among the more tender plants: therefore the "Hints" of last month must not be neglected, and no time must be lost in getting in good stock pots of all the choicest and most delicate flower-garden plants. This remark applies more especially to such tender things as Nierembergia intermedia and filicallis, Lantana Selloviana and crocea, and the more delicate kinds of Lobelias—all of which require to be strong and well established to enable them to get through the winter in good condition. Some of the finer kinds of Petunias and Verbenas, especially the hard-wooded and free-blooming varieties, require to be taken early, or they strike root very reluctantly; indeed it is a good plan to keep a few plants from the spring store, as such plants, if properly established, always produce better cuttings than those rooted in the autumn, and half a dozen established plants of that age will produce more and better cuttings than dozens of plants of the ordinary kind. Climbing plants, such as Maurandyas, should be rooted early to get them strong, and cuttings of the Bouvardias, of various kinds, if not too hard, will root in gentle heat now, and produce nice plants in the spring. Kalosanthes may also still be propagated, as may Rochea falcata, which makes a splendid plant for autumn beds or baskets. We saw the other day some large plants of Gazania pavonia, which, in the full blaze of the sun, have a really magnificent appearance; this plant is not so much cultivated as it ought to be, for upon rockwork, in a sunny situation, it is a most remarkable plant. Proceed, as fast as you can procure cuttings without disfiguring the beds, to propagate Pelargoniums of all kinds, placing the cuttings in a sunny situation in the open garden. Among comparative novelties, Cerise Unique and Commander-in-Chief we find two of the best, and they will both make fine beds. Queen of Summer, though equal in habit to Tom Thumb, and a fine scarlet, is not sufficiently free; and with us, in bright weather, the old flowers burn before the truss is fully formed, and hence it has always a ragged appearance. We have a small gooseberry-leaved Pelargonium which does not grow more than a few inches high, and produces a complete mass of brilliant searlet flowers, which may be classed among the best of the scarlets for small beds; we call it, in consequence of its bright colour, Harkaway. Of the variegated varieties, "Flower of the Day" is very good; but Mr. Gaines, of Battersea, has a much finer one as to colour and variegation, the white of the foliage being very pure, and the scarlet very brilliant-yet, unfortunately, it is a slow grower, and hence may not get into general cultivation for several years to come. The sweetscented kinds, as the Prince of Orange, Rose-scented, Citriodorum, Lady Scarborough, Lady Plymouth, and the like delicate kinds, should be increased without delay, as should the Ivy-leaved and Mangles's variegated.

Towards the end of the month, and through September and October, Roses—more especially the Tea, Bourbon, and Hybrid China kinds—strike with great freedom, providing the wood is tolerably ripe, and the cuttings be kept cool. Under a common hand-glass is a good place; but if taken from the open ground and placed in heat, they are almost sure to perish. The rage for planting the finer kinds of perpetual Roses in masses and separate beds is yearly becoming more fashionable, and, when properly managed, they certainly have a splendid appearance. The limits, however, of a monthly

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periodical procludes our noticing every particular necessary in the flower-garden at this season. We would therefore say, decide upon your arrangements for the coming year at once, and then provide stock of everything that you are likely to require.

Among florists' flowers, continue to increase Pansies as fast as possible; and Pinks, if the wood is not too hard, may yet be put in with success, more especially if you have a nice bottom heat. Proceed with the layering of Carnations and Picotecs, both in pots and the open ground, and supply the Dahlias and Hollyhocks plentifully with manure-water. The late rains have improved these plants very much, and no doubt we shall have a splendid bloom of them this autumn. Phloxes are now coming into bloom, and we would just remind hybridisers there is a wide field open for them in their improvement. Auriculas and Polyanthuses are still in a shaded place; take care to guard against red spider and thrips, and also against worms in the pots. Those who grow Chrysanthemums for exhibition must take care to attend to them at this season.

The greenhouse plants are now principally in the open air; supply them occasionally with weak liquid manure, and take care that neither the spider, thrip, nor mildew, is injuring them. For each of these pests sulphur is a good remedy, and is best applied with a sulphurator while the plants are wet. Some of the fast-growing kinds may require another shift, and such things as Pimeleas which have been cut back, when they have made shoots an inch long, may, if they require it, be shifted into larger pots. Late blooming greenhouse plants must be cut in early, and Phœnocomas and Aphelexes should have the flowers removed, cutting them close in without delay. Look to winter-blooming plants, such as Epacris, Heaths, Styphelias, &c., and take care to get the growth thoroughly ripened, as upon that their blooming in a great measure depends. Remove the flowers of late-blooming Heaths directly they become shabby, so as to start the plants into new growth. Azaleas are still growing, so keep them progressing; but when a plant shows a disposition to go to rest let it do so, and expose it to the full sun to ripen the growth and set the flower-buds. Pelargoniums, both "Fancies" and the common kinds, must be cut down without delay, and those cut down last month, if they have made shoots an inch long, may be potted, taking care to insure liberal shifts in the growing season by putting them into small pots at this time.

In the fruit-garden, wall-trees must have strict attention, as to nailing and keeping them clear of insects; unfortunately, in most places there is not much fruit to protect, but where there is, take timely precaution. The planting out of the Brassicas, and other winter crops, will be the principal operations; but take care to sow good breadths of Turnips and Spinach for winter use, and also of Radishes, Lettuce, and other salad plants. Complaints of the Potato disease have reached us, but we have not much faith in them; still it will be well to keep watch, so as to take the usual remedies in time. If not done already, lose no time in putting out the remainder of the Celery crop, and prepare ground for new plantations of Strawberries. Another crop of French Beans and Early Peas may yet be sown for the chance of a crop.—P.

## THE METROPOLITAN JULY EXHIBITIONS.

NOTHER season has passed over, and once more the exhibitor's troubles are at an end—at least so far as running about to shows is concerned; and he begins to think of the coming year. Perhaps a more brilliant season was never passed, and the thousands of foreigners who have visited our shores will return impressed no doubt with the skill of English gardeners; for though our continental friends may know more of scientific botany, they cannot compete with us in the art and mystery of specimen plant manufacture, neither can they even on the banks of the Rhine grow grapes such as they have seen and tasted in this country. The great fault appears to us to be cultivating collections instead of selections of plants, and hence a great number, rather than quality, is the thing aimed at. Those. however, who are the most successful exhibitors, rarely cultivate many more plants than they require to carry them through the season, and hence their attention being concentrated, they are able to bring the plants out in first-rate style, and directly the shows are over they begin again with all the enthusiasm which a devoted love of the subject can alone induce. But a few days back we had a house filled with plants, each clothed with flowers and of wondrous beauty; but the shows are over, the plants have been cut down, and now they present a wretched appearance. And so exhibitors go on year after year, and it is no uncommon thing with them to cut a plant down in the midst of its bloom, or to denude it of its bloom for the purpose of preparing it for another season. This may appear wantonness, but the gay thousands who admire the gorgeous productions placed upon the tables at a Londen Exhibition, know little of the trouble, cost, and anxiety which have brought them to such

perfection, and those gardeners who have not made the experiment are little aware of the labour attendant upon an exhibitor's life. In many cases they cultivate plants for exhibition in opposition to their employers' wishes, and so far from receiving aid from the employer, we have known an instance in which, after they were grown, the gardener was obliged to show his plants in another person's name. Many of the finest specimens exhibited are the property of the exhibitor, and not of his employer, and we know one person who actually employs a man at his own expense to do his work, while he attends the exhibitions. Indeed, the exhibitor's life may, in many instances, be described as the "pursuit of knowledge under difficulties," and though the gaining of a gold medal may appear a great thing, it will frequently be found that when the expenses are paid, there is in reality but little left for the trouble. The encouragement which exhibitors have received this season has been by no means commensurate with their claims, and we fear there is some truth in the remark, that the more liberally societies are supported, the more illiberal they become to those to whom their success is mainly attributable—for without the exhibitors, success would soon be turned into failure. A lesson of this kind has been taught the Chiswick management this year, as through the prizes for Pelargoniums being insufficient to defray the expenses of carriage; the exhibitors agreed to stop away, and hence but very few plants of that kind have been presented, while at the Regent's Park, the prizes being remunerative, a grand display has been produced on each occasion. We have always contended that these societies have no right to look upon their exhibitions as a source of revenue, at least not until the exhibitors have been properly rewarded, and we are still of the same opinion. The greater their success, the more liberal ought they to be in the reward of exhibitors; but instead of this we are sorry to say they screw them down to the lowest remunerative point, and as we have shown above, sometimes below that. It is easy to talk of exhibitors being discontented, and of their being selfish, and so forth; but the truth is, in these lucre-loving days, we are all selfish, and societies have no more right to expect exhibitors to show below the remunerating point, than exhibitors have to expect a society to sustain an exhibition at a loss to the institution. The profit at the Regent's Park will not fall far short of £5000, and at Chiswick £3000, which we suspect is more than double what they receive from their subscribers: therefore exhibitors ought to have credit for that amount, and, in consequence, to be better rewarded than they are at the present time. We throw these hints out at present as an act of justice to exhibitors, who are not represented by the weekly press, and because we have heard, though we hope there is no truth in it, that there is some intention of applying the "screw" rather tightly upon the prize schedules for next year.

Of novelty we have not had much, but the Rose garden at the Regent's Park was a new feature, though by no means a prepossessing one. The arrangement was pretty, and properly planted would have been effective, but why Roses could not have been planted there without being stuck upon broom-sticks, we cannot understand. If evidence had been wanting to show how monstrously ugly beds of tall standard Roses look, it is wanting no longer, and if this exhibition effects no other good, we know it has opened some people's eyes to the insanity of planting tall standard Roses. But, apart from the style of plant used, there was a great lack of the finer kinds of Roses, more especially of the Teas, Bourbon, and Perpetuals. We saw no groups, as we expected to have seen, of such varieties as Standard of Marengo, Géant des Batailles, Souvenir de Malmaison, Paul Joseph, Madame de St. Joseph, and the like; but there were plenty of summer Roses which would have been better away. In truth the garden looked as if planted with the sweepings of the nurseries, such as could not be sold, and we should hope many of the kinds never will be sold. The Rose growers have defeated their own end, and are justly paying the penalty of planting rubbish where they ought to have sent the very best kinds. Another new feature was the Picotees and Carnations in pots at Chiswick, one side of a large tent being filled with them. They did not come up to our anticipations, but still they were sufficiently good to show that they will ultimately become one of the most attractive features of the July shows, and that they will take rank with the Roses in pots before the close of many seasons. We certainly expected that persons who, in showing cut flowers, display so much taste, and take such great pains to display their flowers to the greatest advantage, would not have been wanting on the score of neatness; but when we say that those persons who had the best plants had huge ugly square sticks supporting them, some of the sticks being a foot or eighteen inches higher than the flowers, and when we say further, that some of the flowers were backed by cards two inches broader than the flowers they supported, it will be seen there was sufficient room for taste to assert her sway, and for improvement in showing Carnations in pots. The growers profess to object to the system of showing; so did Rose growers: they say a plant will not carry more than three flowers, but we warrant them that, as Mr. Beck demonstrated despite all opposition, that Roses could be grown in pots, so will some enthusiastic person show them the way to grow Carnations and Picotees. It is true Mr. Turner's skill has

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not been brought to bear upon the subject, but we were told on the day that he could have shown three hundred pots in full bloom, and we believe his flowers at the present time are in splendid condition, and will well repay a visit to Slough. The days of showing florists' flowers in a cut state, at least at the leading exhibitions, are now numbered; and consequently floriculture may be said to have been raised a step in the scale of cultivation. The prizes offered in our last volume for the best twelve Picotees were awarded respectively to C. P. Lochner, Esq., of Paddington, and J. W. Newhall, Esq., of Woolwich. The contributors in the Nurserymen's class were Mr. N. Norman of Woolwich, Mr. Bragg of Slough, and Mr. Wilmer of Sunbury. John Edwards, Esq., also sent Carnations and Picotees, but not for competition. Other florists' flowers consisted of Pelargoniums, of which a nice group (not for competition) was sent to Chiswick by Mr. Turner, and Mr. Gaines had good plants of both kinds.

Two very interesting and remarkable groups were, the variegated plants from Messrs. Henderson and Messrs. Lee of Hammersmith. Mr. Ivison, gardener to the Dowager Duchess of Northumberland, sent a picturesque group of rare and singular plants, and Messrs. Veitch had their matchless collection of Pitcher Plants, which improve upon acquaintance. We were vexed however to learn that, by a very stupid rule, which precludes the rewarding of the same plants twice in the same season, no prize was

awarded to them, but we should hope the Exhibition Committee will not fail to reward Messrs. Veitch for their trouble in taking them. In the same class we may mention Messrs. Standish and Noble's new evergreens, which are really very fine things. The indispensability of infusing new blood into these exhibitions becomes more apparent, and, in preparing their schedule for 1852, we hope the managers of both societies will not forget the artistic group alluded to in our last number :for a change, melo-cacti



DENDROBIUM FORMOSUM.

might be introduced in July with considerable effect.

Among miscellaneous collections the prevailing plants were, as they always are in July, Allamandas and Kalosantheses, and of both some most remarkable plants were shown. The large collections were rich and fresh for July. Mrs. Lawrence maintained her position at the Park, though with considerable difficulty; but at Chiswick Mr. Colyer's plants were placed first. Both collections contained plants of wondrous beauty, the ferruginous Heath from Mr. Cole, and the Java Ixora in Mr. May's collection, being masterpieces of cultivation. Scarcely less remarkable was Mr. Cole's Ixora alba, a neat bush completely sheeted with flowers; and he had a richly-bloomed plant of Dipladenia splendens. Such plants do one good to see them, and they appeared to strike foreigners with amazement. Messrs. Fraser, Mr. Green, Mr. Taylor, Mr. Speed (a new exhibitor of unmistakeable promise), and Mr. Croxford, each produced some admirable plants. Orchids were less numerous than at preceding shows, and perhaps not quite so rich, but they were gorgeously beautiful. Certain kinds, however, like certain plants in other collections, as the lovely Phalenopsis for instance, begin to get common. As a matter of course, Mr. Rucker's plants were first at both places; indeed his collection is so rich in fine specimens of the most rare kinds, that it appears almost impossible to overtake him. In his collection we noticed the noble "tree" of Vanda Batemanni with two spikes of bloom, and the most admirable plant of Dendrobium formosum it is possible to conceive. It is represented by the annexed engraving; and when we say it was clothed with more than one hundred of its pure white and orange tinted flowers, some idea may be formed of its beauty. Orchid growing such as this, is indeed matchless.

Among specimen plants the thing which pleased us most was a plant of Erica Shannoniana, the true species, from Mr. Salter, gardener to J. M. Yeeles, Esq., of Bath. It was a grand plant of a splendid thing. Messrs. Veitch sent a huge plant of E. metulæflora bicolor, and Mr. Cole had a good Dipladenia splendens and Crowea saligna. Fine Lisianthuses were presented by Mr. Green and Mr. Constantine, gardener to J. Mills, Esq.; and we noticed a nice plant of Hoya bella, trained upright, for which form it is evidently not suited: suspended in a basket it would look much better.

Heaths were numerous and in fine condition, and the cut Roses were very fine. Among the fruit some noble Pines were presented, more especially those from Mr. Jones, gardener to Sir John Guest, Mr. Fleming, and Mr. Spencer; and Mr. Taylor, gardener to J. Coster, Esq., had three bunches of the finest and most perfectly-ripened Muscat of Alexandria Grapes (Barnes' variety) which we have seen for some time. Strawberries, Melons, Peaches, Nectarines, and Pot Grapes were fine, as indeed was the fruit generally. Some unripe specimens were present, but they formed the exception. We cannot close this report without expressing our regret that so many dishes of fine went unrewarded. From Lord Southampton's garden some peaches, averaging nearly eight ounces each, were not noticed, though they were splendidly coloured; and other exhibitors were complaining not without sufficient cause.

### THE NATIONAL FLORICULTURAL SOCIETY.

June 26.—This new society pursues the even tenor of its way, despite the prognostications of its opponents and the misrepresentations of reporters, who, we thought, had been long enough connected with floriculture to have known better. What we complain of is this, that, though the society professes to give three classes of prizes—viz., First-class Certificates, Certificates, and Commendations—some people will not take the trouble to understand them, but huddle the prizes together in most unenviable confusion. Now a First-class Certificate is awarded for a flower which is considered equal to, if not superior to the very best of its class, and hence is nearly perfect; the Certificate marks the second degree of excellence; and the Commendation was intended to mark all flowers which, in the estimation of the judges, were sufficiently good for sending out, either as market, bedding, or garden plants. For illustration, a Cineraria called Formosa, a remarkably showy variety, though almost destitute of a good property, was commended, and no doubt it will be an excellent selling thing. At the last meeting, Phlox Mayii striata, a variety of P. Drummondii, with beautiful lilac flowers striped with purple, in the way of P. Van Houttii, was commended, very justly, as a showy and very desirable bedding plant; and, for our own part, we regret that many more things have not been similarly rewarded.

At this meeting, a certificate of the first class was awarded Mr. Foster of Clewer, Windsor, for a splendid Pelargonium called Optimum, and certificates for Ariadne, Enchantress, and Rubens. These are all fine flowers, a descriptive notice of which we shall give at another time. A number of Fancy Pelargoniums were shown by Mr. Ambrose of Battersea, and a certificate was awarded for one called Richard Cobden, a dark flower, of tolerable quality. A large rosy lilac flower called Lady Emma, shown by Mr. Lochner of Paddington, was commended; it was remarkable for colour only. A Pelargonium called Attraction, from Mr. Turner, was also commended as a market plant. Of Pansies, Mr. Turner received a certificate for Swansdown, a bright flower of great merit; and Mr. G. Rogers had a similar reward for Kossuth, a splendid dark flower. Mr. Hunt's Pandora was also shown in quantity, and fully maintains its character. Mr. Smith had a splendid Verbena called Orlando, which received a certificate. Miscellaneous plants were contributed by Messrs. Henderson and Mr. E. G. Henderson.

July 8.—At this meeting Mr. Foster again produced his Pelargonium Enchantress, but it was out of condition; and Mr. Ambrose had a heavy crimson Fancy of some promise, but very inappropriately named Fireball, which was commended. From Mr. Major were some fine Calceolarias, especially Nos. 1, 9, and 11; but they were much injured by travelling. Fuchsias were contributed by Mr. Turner and Mr. Smith; one called Diamond reflexes splendidly, but possibly too much, and the habit is not good. The others were not remarkable. From Messrs. Henderson, with other things, was Phlox Mayii striata, a very pretty thing noticed before; and Mr. Townsend sent some flowers of Seedling Potentillas, of which it was impossible to form any opinion. Of Picotees, Dodwell's Mary was shown by Mr. Turner, and received a certificate; and Fellow's Prince Arthur, a heavy purple, was commended, though scarcely deserving. Mr. Edwards had a large pink called Titus, and the same gentleman sent a sulphur-coloured Antirrhinum, to which a first-class certificate was awarded. Mr. Smith sent a box of fine Verbenas, and one called Purple Rival was commended. National and Koh-i-noor are promising varieties.

### THE HORTICULTURAL SOCIETY.

July 1.—Sufficient Fellows not being present, no meeting could be held.





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### CANTUA BUXIFOLIA.

Nat. Order .- POLEMONIACE.E.

GENERIC CHARACTER. — Cantua, Jussieu. — Calyx tubular, five-toothed. Corolla hypogynous, funnel-shaped; tube long, straight, or somewhat incurved; the limb five-parted, equal. Stamens five, inserted near the base of the tube of the corolla, exserted, equal. Ovary three-celled. Ovules many, in the central angles of the cells, amphitropous, ascending. Style terminal, simple; stigma three-toothed. Capsule woody, three-celled, loculicidally three-valved; valves bearing the septa in the middle. Seeds few in a cell, ascending, compressed; testa spongy-membranous, produced into a wing at the summit; hilum ventral near the base. Embryo straight, on the axis of fleshy albumen; cotyledons subfoliaceous; radicle terete, inferior.—Erect, branching Peruvian shrubs; leaves alternate, very frequently fascicled, stalked, elliptical, acuminate or wedge-

shaped oblong, quite entire or serrate, or very rarely sinuately pinnatifid; flowers terminal, almost solitary or more frequently corymbose, erect or nodding; corollas large, showy, white, yellow or purple.—(Endlicher Gen. Plant., 3824.)

Cantua Bunifolia, Lamarck.—Box-leaved Cantua.—Leaves somewhat fascicled, oblong or obovate, acute or obtuse, wedge-shaped at the base, entire or with a few incised teeth, glabrous or pubescent; corymbs loose; calyx tubular, pubescent, five-toothed, about one third the length of the corolla; stamens searcely exserted.

Syn.—Cantua buxifolia, Hooker, in Bot. Mag.; Lindley, in Flower Garden.—Cantua dependens, Persoon.—Periphragmos dependens, Ruiz and Pavon.—Cantua tomentosa, Cavanilles, Sc.

ESCRIPTION.—A very beautiful shrub; much branched, the branches more or less downy. Leaves variable, generally oblong ovate, acute, tapering to the base, those on the floriferous branches half an inch long, mostly or all entire; those of the sterile branches larger, often coarsely toothed or lobed, downy or glabrous. Flowers in a kind of terminal leafy corymb, drooping, very showy. Calyx tubular, five-toothed, pale-coloured and membranous, with deep green streaks, more than thrice as short as the corolla tube. Corolla two and a half inches long, with a long wide tube and a spreading coneave limb, composed of five broad obcordate lobes; stamens but little exserted; anthers dark purple. Ovary seated in a fleshy ring; style longer than the stamens; stigma three-toothed.—A. H.

History, &c.—One of the most beautiful introductions of late years, and said to be as hardy and as cultivable as the Fuchsia. Messrs. Veitch are its fortunate introducers; it having been obtained for them by Mr. Lobb from the Peruvian Andes. The cut flowering specimens which have been produced at several of the London exhibitions of the past summer, though failing to show to the full the ornamental capabilities of the plant, yet gave ample evidence of the beauty of its individual blossoms. Our drawing was made from specimens kindly communicated by Messrs. Veitch in June. It was first publicly exhibited last April; though, from a statement in the Botanical Magazine, it would appear to have blossomed in April 1850.

Culture.—If we wanted an example of what inappropriate names the rules of botanical science occasionally compel one to retain, the plant before us would furnish a good illustration. It derives its specific appellation from some resemblance to the Box tree of our gardens; but in what that resemblance consists we are at a loss to discover. To change it, however, would be contrary to botanical precedent. Whether the plant will supersede the Fuchsia, as is said by some, we confess we have some misgivings. It is certainly, when profusely bloomed, a splendid thing; but the Cantuas generally are shy-blooming plants, and we fear that our present subject is not an exception. We shall be glad to find that we are mistaken. Our friend Mr. Beaton, we perceive, thinks it will make a good bedding plant; and certainly there is every appearance of its being a free-growing one, and one that may be readily propagated—all requisites in a plant likely to be required in thousands. In cultivation, it will grow in any good open soil; but to make a good specimen, we should take one of the small plants now sending out by Messrs. Veitch, and give it a liberal shift, using a compost consisting of good loam, leaf-mould, and turfy peat, in equal proportions, liberally intermixed with gritty sand and small pieces of charcoal. We should then place the plant in a tolerably close, but not warm frame, and keep it growing freely until October; we should then ripen it off, and keep it comparatively dormant in the greenhouse until the spring. In March we should start it again in a gentle heat, pot, stop, and train it as much as necessary until the end of July, and then place it in the full sun in the open air until time to house it for the winter. In this way, by accumulating a quantity of highly-organizable matter in the plant, we should hope to bloom it in perfection; at least, if this treatment will not bloom it successfully, we fear the attempt to bloom it freely will be hopeless. Weak, clear manure-water may be given while the plant is in free growth.—A.

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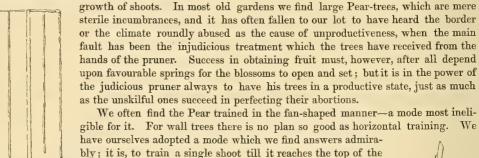
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### THEORY AND PRACTICE OF PRUNING.

BY MR. H. BAILEY, GARDENER TO G. V. HARCOURT, ESQ., NUNEHAM PARK, OXFORD.

THE PEAR.

F all our hardy fruits, there is, perhaps, none which is more generally mismanaged, with regard to pruning, than the Pear. In our perambulations through the country, we too generally find both espalier and wall trees encumbered with a thicket of long barren spurs, producing crops of most luxuriant breast-wood, which is annually removed, but to be succeeded by another equally useless



wall, then two horizontal branches, and from these pendent equidistant branches on each side of the stem, thus (Fig. 1). We find that in all fruit trees the finest produce is yielded at

the extremities of long branches, from the sap being more highly elaborated. This mode of training gives this advantage in an eminent degree, and the pendulous branches are very fruitful. Trees thus trained, and alternating with horizontally trained ones, have a most pleasing effect, both in a useful and artistic sense.

To balance the energies of his tree must be the great aim of the pruner; he must endeavour to arrive at the happy medium between weakness and excessive vigour, by checking the strong and encouraging the weaker growths; and whatever the subject with which he has to do may be, he must ever bear in mind the importance of having no more shoots than can be fully exposed to the action of light: this, in our climate, is of an importance not to be overrated, seeing what a large proportion of dull, damp, sunless, suicidal days our summers are made up of.

The continental gardeners, particularly the French, with all their advantages as to steady summers, and more genial suns, attach great value to reducing the amount of summer growth by timely pinching, or preventive pruning, and were the system, with root pruning, more generally practised, the most happy results must follow. Having premised thus much, we will now proceed to explain:-firstly, the formation of the horizontally trained tree; secondly, the mode of bearing, and management of the spurs: thirdly, the pendulous or quenouille mode of training; fourthly, the pyramidal or modern French mode; these three modes comprising the most valuable and useful forms in which Pear trees are trained.

Fig. 2 represents a one year old or maiden Pear tree, which it is intended to train horizontally. To effect this, it must be shortened at the time of winter pruning to three buds, a, a, a, one of which is to form the central stem, and the other two the bearing side branches. The middle shoot must be trained perpendicularly, and the other two may at first be laid at about an angle of 45°, to be brought to a right angle with the main stem at the next winter arrangement. The following season

our tree will be represented by Fig. 3, and the centre shoot must again be shortened to three buds, leaving about a foot or fourteen inches between them and the lower branches formed in the previous year; the buds not intended to grow should be rubbed off. If the central shoot grows vigorously another pair of horizontal branches may be obtained by pinching it at the proper distance, at mid-



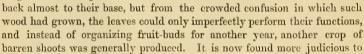


Fig. 1.

summer. This is very desirable, as you thus get two sets of shoots for one, in the same space of time, an object of much importance in furnishing a wall. A repetition of this course of treatment will furnish the space allotted, whether of wall or espalier rail.

Fig. 4 represents a two year old shoot, with naturally formed blossom

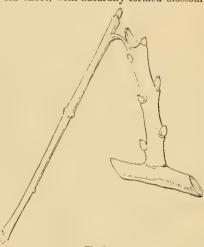
buds. The fruit of the Pear and Apple is produced upon short studs or spurs, which proceed laterally and terminally from the main branches. To have the branches regularly covered with fruit-spurs must, therefore, be the object of the pruner. In the second year after the shoots which are to be the bearing branches are formed, the buds along them will produce shoots which may be treated in two or three different manners, with the same object in view. The old practice was to allow them to grow a considerable length, and then prune them



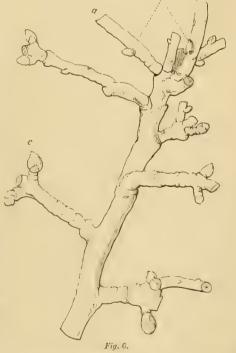
stop them when they have attained the length of two or three inches, the result of this is, that embryo fruitbuds are formed at the base of each shoot so treated. We have also successfully practised the following mode, namely,-when the shoots have grown to nine inches or a foot in length we break them through, leaving them suspended by a portion of the bark. The light that is admitted to the unmutilated base-leaves increases their elaborative power, and the sap is partially repulsed at the fracture, to be expended in forming embryo fruit-buds,

two or three of which will be found at the base of each shoot in the autumn (see Fig. 5). Careful root-pruning will always control vigour and tend to induce fruitfulness. A watchful eye must be kept to have the fruitful spurs short and close to the wall, without which caution they will elongate and look unsightly, exposing the blossoms to greater risk of injury from frost, by removing them from the shelter of the wall.

frost, by removing them from the shelter of the wall. In Fig. 6, a represents a spur from which a fruit was produced last year. At its base will be seen an embryo leaf-bud, b, to which it must be cut back; this will, in the ensuing season, become a blossom-bud: c, which will produce fruit in the third





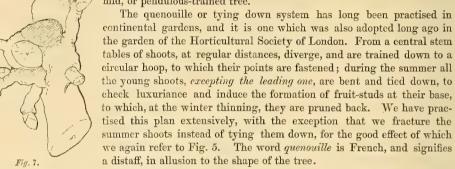




year, other circumstances being favourable, and the process of shortening must again be repeated. If spurs become long and do not indicate buds at their base, they may be cut back, leaving a shoulder (Fig. 7), from which a bud, or buds, is almost sure to proceed in the following spring. These obser-

vations apply to the Pear-tree whether against a wall, an espalier, a pyra-

mid, or pendulous-trained tree.



Pyramidal training, as its name implies, presumes a tree to be in the shape of a cone, or pyramid; and to be perfect, it should be clothed with fruit-bearing spurs from its base to its summit. As it is the most natural form in which Pear-trees can be trained, so is it also the most advantageous, by the very equal amount of light which is afforded to the lower, as well as to the upper, branches and leaves. It is of moment, in this sunless climate, to adopt such a mode of training as will expose the largest surface of foliage to the direct action of the solar influence; and, next to wall-training, no other plan affords this advantage in an equal ratio. Another great advantage is the economy of space, thus enabling the amateur, with a few rods of ground, to combine the multum of horticultural interest with the minimum of space. To those who would do this, we earnestly recommend the perusal of our friend Mr. Rivers of Sawbridgworth's admirable little treatise, The Amateur Fruit Garden. strongly recommends Quince stocks for pyramidal Pears, and certainly, in situations where they flourish, they are excellent; but on many dry gravelly soils they only languish and die, this stock requiring a strong, moist, unctuous loam to grow in. In such soil Pears or Quince stocks, root-pruned so as to become a mass of small hair-like fibres, and the shoots pinched on the plan of M. Cappe (see Gardener's Chronicle) are interesting, satisfactory, and beautiful objects.

We will suppose a young tree planted to form a pyramid. In the first year it will put forth four or five young shoots. Select that which is most suited for a leader, and pinch the points of all the rest when they have grown to the length of two inches. Should they push again repeat the process, making occasional exception in favour of shoots which are too vigorous, and taking care not to pinch the shoots at the base of the tree so closely as those of the upper part, in order to induce the pyramidal form required. Sometimes the pinching severely causes the young shoot so operated upon to die off and converts the embryo-spurs at its base into shoots. This is, however, the exception rather than the rule, which is, that the shoots so pinched remain stationary and form fruit-spurs at the base. A few of the shoots may require a little regulation by tying out when the tree is young, so as to ensure regular shape.

The management of Pears as standard orchard trees has been so often explained, and is so generally understood, that we do not think it necessary to advert to it in this paper.

### THE APPLE.

The Apple is so similar in its mode of bearing to the Pear, that it would be mere tautology to illustrate it. The mode of training, too, which is most generally in use (the horizontal) is common to both fruits, and need not be again explained. But, although this is the case, we are convinced that the pyramidal, or even the quenouille, mode, would answer admirably if the kinds were worked upon the dwarf or paradise stock, and treated as directed for the Pear, both as to summer and root pruning. Such little symmetrical pyramids of fruit are most interesting objects, and have the concomitant advantage of doing little injury to the neighbouring crops.

Some years ago there existed, in the garden of the Horticultural Society, at Chiswick, a row of Apple-trees (standards), the points of whose branches were pulled down by strings, and which were trained in the shape of a balloon; they were pretty and very fruitful. Other modes of training might be adverted to, but as many of them are more fanciful than useful, the reader is referred to Loudon's Encyclopædia of Gardening, in which full descriptions will be found.

When treating of pendulous training, we omitted to mention the good effects of it on a number of fruit trees at Spring grove, then the seat of Sir Joseph Banks. It was here, if we mistake not, that we first saw it adopted as a system, under the personal direction of that talented and erudite philosopher. His trees were trained up one side of a wall, over the coping, and down the other.

### ON THE MANAGEMENT OF STRAWBERRIES FOR FORCING.

By Mr. J. L. Middlemiss, Gardener, Bentham Hill, Tonbridge Wells.

PMHOSE plants which have been forced and planted out in a piece of good ground will furnish the best runners for forcing purposes. These runners should be layered into the fruiting pots early in July, in order to secure well ripened large plants before the end of October. The soil best suited for Strawberries in pots is composed in the proportions of three barrow-loads of good fresh fibry loam, two barrowfuls of leaf-mould, and in the absence of a barrow load of thoroughly rotten cowdung, two barrow-loads of Mushroom bed dung, a barrow-load of sand, if the loam be not of a sandy nature, and a few handfuls of soot, all well mixed together. The pots should be well drained, and a handful of soot put over the drainage. The soil should be made pretty firm by rapping the bottom of the pots on a piece of board, which should be lying near for the purpose (mother earth being the potting bench when Strawberry pots are to be filled), keeping the thumb of each hand on the surface of the soil, to prevent it jumping up and allowing the drainage to be displaced. I once called at Mr. Rivers's, when they were filling their Strawberry pots, and they were actually beating the soil into the pots, making it almost as hard as a road. I have some, to me conclusive, experiments on this plan of consolidating the soil for such things as Wheat, Barley, Oats, Turnips, Potatoes, Onions, &c.; but for the present I will only state that it is a good plan to make the soil in Strawberry pots very firm.

In laying the runners, if any of them have struck root, care should be taken not to break the roots in taking them up. The roots should be spread over the soil in the pot, not pushed into a hole in the middle, and a little loose earth put over them, and a stone placed behind the runner to prevent the wind blowing it about. The runner next the plant only should be chosen, and any runners beyond this should be pinched off. As soon as they are fairly rooted they should be separated from the parent plant and removed to a rather shady situation (or placed where they can be shaded) for a week or so, till they get over the check they are sure to sustain, when they may be removed to a situation fully exposed to the sun. This is of the utmost importance, as the production of fine trusses of fruit depends very much upon the crowns being well ripened. The pots should not be plunged but set on a bed of ashes, and a board set on edge in front of the front row to prevent the sun burning the roots through the pots, the other rows shading each other. Plenty of water must now be given, never

allowing a single plant to flag.

As soon as there is any danger of frost they should be removed to their winter quarters. If room can be spared they are best placed in low span-roofed pits, where they are to be forced, the pits being divided into compartments of about three lights each; one part of which being kept closer than the others would prepare the plants for an early start, and they would want but very little heat to bring them into flower. I consider the Strawberry worthy of a pit for itself, and were it convenient to have such they would be found very useful for late Cucumber and Melon crops afterwards. But as it is only in a very few places that pit room can be spared to stow them till wanted, temporary pits may be made out of any old slabs, say two feet high at back, and eighteen inches in front, the pots to be plunged up to the rim in rough ashes, and to be covered over with wooden shutters when there is any danger of frost or rain. They will not want any water now, but must not by any means be covered in fine weather. These temporary pits may be made so that they shall not disfigure any part of the garden (which might cause them to be placed in any out of the way back locality, where the sun can never reach them), by laying turf about six inches wide, and building it up to the top all round. This also effectually protects from frost.

Great care must be used when the plants are removed to their forcing quarters, very little heat being required to start them into growth. It is hardly possible to give rules for guidance as regards the temperature; we must be guided much by changes in the weather. They should, however, he very gradually brought on. The temperature at first should not be higher than from 46° to 48°, unless by sun heat; rising gradually, as the plants advance, to from 58° to 60°. Where it is convenient they would be much benefited by being plunged in a slight bottom heat, keeping the plants cool at the top to get the roots in motion first. They should at all times have a free supply of air, more especially when they are blooming, and the atmosphere must then be kept dry to secure their setting freely.

As soon, however, as the setting process is over, they will bear a moist atmosphere, provided plenty of air is given; but for very early forcing great caution must be used in watering,—watering only where it is needed. They are sure to go blind if they are carelessly watered early in the season.

As the season advances they will require a great deal of water, and as soon as the fruit is set they are greatly benefited by being watered every other time with weak liquid manure; but this must be discontinued as soon as the fruit begins to colour. I do not like putting the pots in saucers, but where the plants are forced in vineries on shelves on the back wall, it is a good plan to prevent their drying so very quick, to place something up in front of the pots, which shall not be high enough to shade the plants, but which will preserve the roots from being scorched through the pots. They should never be more than eighteen inches from the glass, and have plenty of light. I never put more than one plant in a pot (No. 24), and by following the above system as near as circumstances will permit, I have frequently picked 8, 9, and 10 oz. from one pot, which is not a bad crop. I find the Keene's seedling and Alice Maud force best; the British Queen is very good for a late crop, but it is not nearly so profitable as the two first mentioned.

### THE CHEMISTRY OF SOILS AND MANURES.

By Dr. A. VOELCKER, Professor of Chemistry in the Royal Agricultural College, Cirencester.

ON THE CLASSIFICATION OF SOILS.

AF any person could with one coup d' wil observe the various soils found in different places over the earth's surface, the comparison of some of them would afford many striking differences and peculiarities, in respect to position, thickness, extent, agricultural capabilities, and other properties, whilst at the same time, many would be found so slightly differing from each other, that he would experience much difficulty in discriminating between them, though, on minute investigation, their characters would be found differing in many respects. Distinct lines of demarcation are nowhere found, which might assist us in the characterising of the several classes of soils. This difficulty, which opposes itself to a simple and good arrangement of soils, is greatly increased by the vague manner in which soils are frequently described by agricultural writers, and the various acceptation of such terms as hazelloam, brown loam, clayey loam, fat soil, sandy soil, humus soil, garden mould, &c., in different parts of the country. The want of a proper definition of these and other terms is so perplexing, and the meaning which people in different localities attach to them, so variable, that it is difficult for the gardener who reads a description of a soil, in which a certain plant best succeeds in another country, to judge what relation this soil bears to his own.

Soils in general consist of a mechanical mixture of the following four substances:—1. Silica, silicious sand and gravel.—2. Clay.—3. Lime.—4. Animal and vegetable remains (humus). Few soils are found to consist altogether of one or two of these four substances: most contain them all, but the relative proportion of each in different samples varies considerably; and as just on this relation the fertility, agricultural capabilities, and other characters mainly depend, a natural division may be founded on the preponderance of one of these four chief constituents.

Upon this principle soils may be conveniently classified as follows:-

- 1. Sandy soils, containing above eighty per cent. of silicious sand.
- 2. Calcareous soil, containing above twenty per cent. of lime.
- 3. Clay soils, containing above fifty per cent. of clay.
- 4. Vegetable moulds (humus soils), soils of various composition, containing always more than five per cent. of organic matter.
- 5. Marly soils, in which the proportion of lime is more than five per cent., but does not exceed twenty per cent. of the whole weight of the dry soil, and that of clay is more than twenty, but less than fifty per cent.
- 6. Loany soils, in which the proportion of clay likewise varies from twenty to fifty per cent., but which contain at the same time less than five per cent. of lime.
- I. Sandy soils.—They are generally of a loose, friable, open, dry character, and for that reason more easily cultivated, and with less expense, than any other. Many consist almost entirely of silicious sand and gravel, with but little alumina and calcareous matter. Such soils are almost absolutely barren and in general termed hungry, from their tendency to absorb manures, without any corresponding benefit to the land. Others, containing a larger proportion of alumina and lime, which render them more compact, and always more fertile. On these richer kinds of sandy soils, beans, peas,

and spring wheat succeed well, and as turnips are frequently grown with advantage on them, they are called occasionally turnip soils. Sandy soils are capable of improvement, which, in many cases, repays well the expense of labour and material. Clay, marl, chalk, and any other substance which has a tendency to counteract the loose texture and porous character of sandy soils, may with advantage be applied to them. In England, examples of this class of soils are found in those resting on the old red sandstone, the granite formation, the millstone grit, the sand of the coal-formation, &c.

### ANALYSES OF SANDY SOILS (DR. SPRENGEL).

			No. I.	No. II.	No. III.	No. IV.	No. V.	No. VI.
Silica and quartz sand			96.000	92.014	90,221	98.8	96.7	94.7
Alumina			0.500	2.652	2,106	0,6	0.4	1.6
Oxides of iron .			2.000	3.192	3.951	0.3	0.5	2.0
Oxide of manganese			trace	0.450	0.960			
Lime	-		0.001	0.243	0.539	0.1	trace	1.0
Magnesia.			trace	0.700	0.730	0.1	0.1	trace '
Potash			do.	0.125	0.066		trace	1 03
Soda			do.	0.026	0,010		do.	0.1
Phosphoric acid .			do.	0.078	0.367		do.	trace
Sulphuric acid .			do.	trace	trace		do.	do.
Chlorine			do.	do.	0.010		0.1	
Organic matter (humus)			1.499	0.490	1.040		2.2	0.5
			100.000	100 000	100.000	99.9	100.0	99.9

No. I. Barren sandy soil, near Wettingen, in Lüneburg.

No. II. Sandy soil, near Drakenburg, on the Weser, producing very bad red clover.

No. III. Near Gandersheim, in Brunswick, growing luxuriant crops of pulse, when manured with gypsum.

No. IV. Very barren drift-sand, near Meppen.

No. V. Barren sandy soil, near Aurich, East Friesland.

No. VI. Fertile sandy loam, near Brunswick, producing luxuriant crops of lucerne, sainfoin, lupins, poppies, &c.

II. Calcareous soils.—As the physical characters of the calcareous soils depend chiefly on the relative proportions of lime and other constituents which enter into their composition, it is impossible to give a short general characteristic. Whilst some are deep, dry, loose, and friable in their nature, and on the whole productive, as some soils resting on the lower chalk-formation; others are stony, poor, thin soils, producing but a scanty vegetation, as those resting on the shelly oolite. Leguminous plants, as peas, beans, vetches, sainfoin, and clover also, are grown with advantage on this class of soils, because these crops require lime as an essential element for their healthy growth. According to the proportion of pure clay and silica which is present in calcareous soils, they are called calcareous clays, or loams, or calcareous sands. All contain more than twenty per cent. of lime. Examples of calcareous soils are found in England—in Wiltshire, Dorsetshire, Gloucestershire, Norfolk, Suffolk, &c.

ANALYSIS OF A CALCAREOUS SOIL FROM SOUTHROP, GLOUCESTERSHIRE, (DR. A. VOELCKER).

Lime			•			52.33
Magnesia .						.31
Oxide of iron and	l alumina					2.86
Phosphoric acid						traces
Sulphuric acid						do.
Silica						26
Carbonic acid .						44.70
						200.10
						100.46

III. Clay soils.—The properties of clay soils are most diametrically opposed to those of sandy soils. Stiffness, impenetrability, great power of absorbing and retaining moisture, and great specific gravity characterize this class of soils. They are consequently cold, stiff, heavy, impervious soils, which are expensive and difficult to cultivate, and often quite unproductive. When properly cultivated, however, some of them turn out to be very fertile. The best means of improving heavy clay land, next to perfect drainage, is the practice of burning such stiff soils with wood, faggots, branches of trees, grass-sods, or any other vegetable refuse matter, or with coal, where it may be procured at a moderate price. Mixing with chalk and sand likewise renders clay land less stiff, more porous and friable; but we would particularly recommend the process of burning, because the land is not only thereby changed in its mechanical texture, but chiefly because burnt clay acts chemically as an excellent manure. In examining the changes clay undergoes in burning, we have found that its constituents are rendered much more soluble, provided a moderate heat has been applied in the process, and further, that potash, a valuable fertilizing substance, in particular, is rendered soluble and liberated from the clay, in which it occurs in an insoluble combination. Clay soils abound in many parts of England; some of our best wheet land belonging to this class of soils.

### ANALYSES OF CLAY SOILS. (DR. VOELCKER.)

						No. I.	No. II.	No. III.
Water, driven off at 212° F.			,			5.539		
Organic matter and water of	combin	ation				3.621	3.38	6.11
Oxides of Iron .					. 1	0.050	8,82	7
Alumina					. 1	3.070	6,67	8.31
Carbonate of Lime .						.740		·
Lime					.		1.44	, 11
Magnesia						.605	.92	1.49
Potash						.269	1.48	65
Soda						.220	1.08	60.
Phosphoric Acid .					ĺ	.386	.51	
Soluble Silica .				-		1.450	72.83	.04
Insoluble Silicates (fine clay)						84.000	12.00	80,69
Chlorine, Sulphuric Acid						traces.	traces.	traces.
Carbonic Acid and loss							2.87	2 27
						100.000	100.00	100.00
l de la companya de								1

No. I. Clay soil of the New Red Sandstone formation near Bridgewater, improved very much by burning.

No. II. Clay soil from Huntstile Farm, near Bridgewater.

No. III. Clay subsoil, from Mobberly, in Cheshire'.

## New Fruits.

Gathoye's Peach.—M. Gathoye, horticulturist near Liege, has raised from seed this new variety of peach, which deserves to be in every good collection. The form is rounded; its diameter is from an inch and a half to two inches; the stalk short, bearing at the base one or two leaves, which are long, straight, finely toothed, and sharply pointed. The stalk is inserted in a deep cavity; sometimes at the summit of the fruit there is a small short point; sometimes a slight cavity. The down is short and not very abundant. The ground colour is yellow passing to pale green at the parts shaded, the yellow almost entirely covered with innumerable red dots; the colour formed by this dotting at the side next the sun is deep purple. It is more remarkable for its rich colour than for its size.

Count d'Ansembourg Peach.—This is a variety newly raised by M. Gathoye. It is of large size and is particularly characterized by its spherical form, slightly elongated, and by a fine and reflexed point at the summit. The medium size is about three inches in length, and two inches and a half in breadth. The stalk is deeply inserted. The skin is covered with fine silky down, of a light-green colour passing to deep violet on a purple ground at the side next the sun, and ultimately becoming almost quite black; the whole is studded thickly with innumerable red spots or freckles. The flesh is greenish, and of a blood red colour next the nut. The flavour is very agreeable, being sweet and vinous, and having a delicate aroma. The tree is vigorous.

Lekerbetje Pear.—Every body knows the Glou or Goulou Morceau Pear, to which M. de Bavay gives also the synonymes of Beurré d'Hardenpont, Goulou Morceau de Cambron, Beurré de Kent, Beurré Lombard, and also Beurré d'Arcmberg. Although M. Verreghem, a distinguished pomologist of Furnes (West Flanders), has named his new Pear Lekerbetje, which in Flemish has the same signification as Goulou Morceau, it must not be supposed that these two fruits are identical. This is an excellent variety, being very sweet and well flavoured. It measures from three to four inches long, and about two inches and a half broad. Its form is turbinate, almost always oblique, or crooked; the point long, and attenuated to the stalk which is of a brown colour. The eye is small, circular, and bordered. The skin is green, rough to the touch owing to the red and yellow gritty particles, between which the green is seen. The flesh is soft, juicy, very sweet and aromatic. The tree does not attain a great size, but is very hardy and fertile. It grows freely in the sandy soil of Furnes, where the fruit generally ripens between the first and third week of October.

Childeric I. Pear.—This Pear, obtained from an espalier, appears to have originated from the Duchesse d'Angoulême, which is, as is well known, one of the Belgian varieties, having been first discovered in the neighbourhood of Antwerp; subsequently it came to be much grown in the island of Jersey, and has there been generally found to weigh about twenty-two ounces. Childeric I. differs from the Duchesse d'Angoulême by its length, its form, and the absence of protuberances so conspicuous in the latter. Its length is from four to six inches, and its greatest diameter at the base is from two to three inches. The eye is regular and placed in a somewhat deep orbicular cavity. The skin is greenish, inclining to yellow at maturity, much spotted or freckled, the freckles being of two kinds, yellow and brown, which is not the case with the Duchesse d'Angoulême. It ripens about November or December: the flesh is very sweet, white, juicy, and grateful. According to M. Decrasse the tree is very fertile and vigorous, and well adapted for training in the espalier form.—La Belgique Horticole.





Fentiterion cymnanticus

### PENTSTEMON CYANANTHUS.

Nat. Order .- SCROPHULARIACE E.

Generic Character.—Pentstemon, L'Heritier.—Calyx five-parted. Corolla hypogynous, the tube almost terete, the throat somewhat inflated, the limb two-lipped, the upper lip emarginately two-lobed, the lower three-lobed, naked or bearded at the base. Stamens inserted in the tube of the corolla, four fertile, didynamous, exserted; anthers two-celled, the cells divergent; the fifth stamen without an anther. Ovary two-celled, the placentas adnate to the dissepiment on both sides, bearing many ovules. Style simple; stigma obsoletely two-lobed. Capsule two-celled, septicidally two-valved, placentas adnate. Seeds numerous, angular, without a wing.—Perennial herbs, natives of North America and tropical America south of the equator; leaves opposite, entire or serrate; peduncles axillary and terminal, few-flowered, bracteate, arranged in racemes

or panicles; corollas scarlet, purple, and violet (or blue).—(Endlicher Gen. Plant., 3909.)

Pentstemon Cyananthus, Hooker.—Azure-flowered Pentstemon.—Stems erect, simple; leaves entire, the radical ones oblong-spathulate, acuminate, petiolate; the stem ones sessile, cordate ovate, with a long acuminate point; peduncles axillary, bearing dense cymes, arranged in a whorl-like manner, and forming long terminal crowded spikes of flowers; sepals narrow lanceolate, subulate, corolla ventricose upwards, the limb two-lipped, with nearly equal segments; anthers and sterile stamen hairy.

SYN.-Pentstemon cyananthus, Hooker, in Bot. Mag., t. 4464.

ESCRIPTION.—A perennial herb, with the radical leaves spathulate, acuminate, and tapering below into a longish petiole. Stems erect, from one and a half to two feet high, terete, unbranched. Leaves all entire; those of the stem very broad, and remarkably acuminate, but variable in size, sessile, cordate-ovate, ending in a long narrow acuminated point. In our specimens the stem leaves are much smaller than those represented in the Botanical Magazine; the upper leaves decrease gradually in size, the uppermost being reduced to subulate bracts. Flowers forming dense spikes, a foot or more in length, on the upper part of the stems, and produced in pseudo-whorls from the axils of all the upper leaves; peduncles opposite, short, bearing cymes of many crowded flowers. Calyx of five subulate spreading sepals. Corolla large, the tube an inch long, ventricose upwards, and having a reddish or purple tinge; the limb two-lipped, spreading, very bright clear azure blue, the segments blunt, and nearly equal in size. Stamens and pistil included; the filaments curved; the anthers and sterile stamen hairy.

History, &c.—This very beautiful hardy herbaceous plant was first brought into notice, in 1849, by Messrs. Lucombe, Pince, & Co., of the Exeter nursery, to whom we are indebted for the specimen figured in the accompanying plate. It is a native of the upper valleys of the Platte River, in the Rocky Mountains, from whence seeds were obtained by Mr. Burke. The numerous compactly arranged and beautifully coloured flowers have a fine effect, and render this one of the most desirable additions to our hardy flowering plants. It blooms freely in May and June; and we understand, like P. speciosus and Gordonianus, and others of similar character, does best when raised in succession from the seeds annually.—M.

Culture.—Beautiful as most of the Pentstemons certainly are, this is one of the most levely; but possibly, like P. Cobæa and Murrayanus, it is not every locality or situation that will suit it. It is, unfortunately, of rather delicate constitution, at least it has been found so in the London nurseries; and it may be like the two species above named—it may flourish to perfection in a more northern latitude; as both P. Cobæa and Murrayanus grow admirably near Glasgow and Edinburgh, though we in the south rarely see a healthy plant. The chief and greatest enemy is mildew, which attacks the plants with such pertinacity as almost to become eradicable; indeed we have seen scores of plants of P. Murrayanus perish from that cause only. A timely and constant dressing with sulphur is the only remedy; and sometimes even that will fail. In the cultivation of this plant, we should treat it as a frame perennial, nursing it carefully through the winter, and planting it in the open border in May. The soil most suitable for it will be found to be, turfy loam two parts, rich peat one part, and one part of half-decomposed leafmould, to which sufficient gritty sand and charcoal broken small may be added to make the whole free and open. A similar compost we should use in the open ground, taking eare that the plant was in a well-drained situation. This, like the other Pentstemons, may be propagated by cuttings, which are rather shyly produced; but best by seed, which should be sown in light soil, in gentle heat, any time between March and August. The plants will require careful nursing in frames, and will make nice specimens for turning out the following spring.—A.

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# Vegetable Physiology.

BY ARTHUR HENFREY, Esq., F.L.S., LECTURER ON BOTANY AT ST. GEORGE'S HOSPITAL.

THE FOOD OF PLANTS.

MHE next question we have to deal with is that of the food of plants, and here it becomes necessary to take note of two distinct branches of the subject, to the elucidation of which, chemistry, our great guide in these investigations, contributes very unequally. The first part of the question refers to the elementary nature of the indispensable food of plants; and chemical analysis, by telling us the composition of the perfect organisms, at once answers our inquiries in this direction. But the second question, In what form or mode of combination do these elements enter the vegetable structures? is very imperfectly solved by analytical research according to the present methods, and it is chiefly by means of experiment that we are enabled to obtain a few imperfect data for reasoning out definite views on this head.

The first question may be quickly disposed of. Destructive analysis of vegetable substances, resolving them into the simplest elements into which chemistry can at present separate the materials of creation, shows that those elementary substances which are met with constantly in plants amount only to eighteen, viz., the universal elements oxygen, carbon, hydrogen, and nitrogen; the bases of the earths calcium, aluminum, silicium, and magnesium; the readily acidifiable bases sulphur, phosphorus, chlorine, iodine, bromine, and fluorine; the bases of the alkalies potassium and sodium; and the metals iron and manganese. These elements are not all of equal importance in the vegetable kingdom, a portion only being universally present, while some of the rest, which only occasionally occur, are even capable of replacing one another. Thus the first three, oxygen, hydrogen, and carbon are universal, forming the elements of which cell-membrane, starch, and sugar—those matters always present, are composed; then nitrogen enters into the composition of all the albumen and similar products contained in the cells, with which sulphur and phosphorus also are intimately connected, though in far smaller proportion. These may all be regarded as necessary constituents; but the bases of the alkalies and earths appear to be less absolutely essential, since not only may one take the place of another, but it is stated that in some cases ammonia may be substituted for them; this, however, must be looked upon as a very exceptional case, and, as a general rule, alkalies and earths, and mostly particular kinds of earths, are necessary parts of the food of plants. Chlorine is a necessary constituent for certain plants; iodine and bromine are of less account, while silica, iron, and manganese are met with less frequently, or in less abundance than any of the others; save in certain special cases, as in those plants which, like the Grasses and Horsetails, have a silicified epidermis.

Oxygen is the only one of these elements which is absorbed in a pure state into vegetables, all the rest are taken up in some condition of combination, capable of being decomposed by the plants themselves. One of the most vehemently debated controversies in the chemistry of vegetation has arisen from the different opinions held by different observers as to the nature of these combinations: whether they were necessarily organic or inorganic. As in so many other instances, the truth appears to be in the middle, and unprejudiced inquirers will be inclined to believe from the evidence now before

us, that both inorganic and organic compounds are absorbed by plants.

Common observation, as well as direct experiment, prove that the majority of plants obtain the greater part of their food from inorganic sources; since when generations succeed each other for a long period the mass of decayed organic matter left behind by them undergoes continual increase, showing that they produce more than they consume. Saussure's experiments prove that plants will increase their organic matter when grown in water in a closed vessel containing an atmosphere rich in carbonic acid; and plants have been made to grow, and even to flower and bear seed in earths which had been deprived of all organic matter by being heated to redness. This point is so clear that it now scarcely needs demonstration.

But it is by no means proved that inorganic substances are the sole food of plants; that the organic substances contained in black mould are only used after being decomposed into their inorganic constituents; nay, in reality it is not shown that all plants are capable of living upon inorganic food. In the latter case we have the parasites which live upon the juice of living plants, and in many cases upon the sap of some particular plant or group of plants. Some of these parasites are, it is true, very peculiar in colour and habit, bearing leaves of imperfect character, and behaving as it were as flowers and fruits towards the plants which support them; but a sufficient number, like the Loranthacere, resemble other plants perfectly. Again, many plants will live only in decaying vegetable or animal substances, and a large portion of them resemble the brown fleshy parasites in external aspect,

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while others have no such peculiarity, e.g. the Fungi, the Orchids, Bog-plants, &c. Lastly, it is commonly seen that many plants remain comparatively poor and starved-looking when grown in soil devoid of organic matter, while others will flourish in soils containing few traces of it. Thus, while the Heaths, Brooms, Buckwheat, &c. &c. grow in the poorest soils, the corn-plants require an accumulation of mould or decayed vegetable matter to enable them to grow in any degree of luxuriance.

It is clear, therefore, that there exist many varied conditions among vegetables in regard to the character of their food; that in some the power of assimilating inorganic substances prevails, in others there is a necessity for the intermixture of a certain proportion of organic matter, and lastly, in a comparatively small number, the true parasites, the organised food is required in a fresh and unaltered condition, just as it is delivered by the stock to the graft in our cultivated fruit trees,

The inorganic compounds most largely absorbed by plants are formed of the four principal elements—carbon, oxygen, hydrogen, and nitrogen; and consist of water, carbonic acid, and ammonia. The mode in which water is taken up by plants has been spoken of in a former chapter, in discussing the absorption of fluids; but with regard to the carbonic acid it is necessary to enter into some further details. Carbonic acid is met with universally, diffused in the atmosphere and dissolved in water: in the latter condition it is of course absorbed by the roots of plants, but much more than is supplied in this way enters into the vegetable structures; and it has been proved by experiment that the green parts of plants, and in particular the leaves, whenever they are exposed to sunlight, are capable of absorbing a great deal of carbonic acid either from air or water, and that they set free a proportionate quantity of oxygen. It was calculated by Chevandier that the trees of a forest remove one-ninth of the carbonic acid contained in the column of air standing over them, during the five summer months through which their leaves live.

The oxygen which is given off appears to be a direct secretion from the superficial green parts, and is not contained within the plant for any time in a gaseous condition before it is given off; for plants which contain no air, such as Confervæ, or leaves which have been exhausted of their air beneath the air-pump, in like manner give off oxygen gas. Pieces of torn leaves possess the property as strongly as whole leaves; but leaves which have had their structure destroyed by pressure give off no oxygen, neither does the epidermis.

According to the researches of Dr. Draper, the amount of oxygen given off is different under different rays of the spectrum; it being found that the effect was proportionate to the illuminating power, the chemical and heating rays having no effect at all. The same author found also that the gas given off by plants in the sunlight does not consist of oxygen alone, but always contains a certain amount of nitrogen; and he goes so far as to regard this separation of nitrogen as a necessary and even primary phenomenon, indicating the action of a nitrogenous ferment, which causes the decomposition of the carbonic acid. Some interesting experiments on this subject were published in this Magazine some months back.

The absorption of carbonic acid and the separation of oxygen which take place in the sunlight, form but a part of the processes carried on in the decomposition or recomposition of those elements. The alternations which take place between the products given off in the night and in the day is clearly made out, and leads to more curious speculation respecting the assimilative processes of plants. Of these we shall speak in another chapter, under the head of Respiration.

### FLORICULTURE OF THE TOILET.

WHE floriculture of the toilet embraces the choice, culture; and general knowledge of all those plants which are susceptible of ornamenting the human form. This science, if such it may be called, forms the most important feature in hair-dressing, and enters largely into the complete requirements of a good education. As a branch of floriculture it ranks among the most ancient inventions; and if its laws have not been reduced to system, it has not been for want of examples or of application.

M. Jules Lachaume, in an elegant work, entitled *Natural Flowers*, or, a Treatise on the art of composing Crowns, Garlands, and Bouquets of all kinds, for Balls and Evening Parties, has been one of the first to open up this subject. We translate the following from *La Belgique Horticole:*—

One of the favourite amusements of infancy is to plait crowns with the wild flowers of the woods and fields. The timid lover expresses his passion by the homage of a bouquet; and the young belle naively abandons to her favourite the flowers which decked her brow or withered on her bosom. Old age itself smiles on flowers. Crowns and other garlands may be traced to the most remote antiquity. Among the Greeks and Romans the crown was, so to speak, the ordinary hair-dress of the great

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philosophers. Socrates had always his head encircled with flowers. Alcibiades changed his crown three times a day. At eighty years Anacreon mixed roses with his white hairs. Cæsar, who was bald at thirty years, was indebted for a long time to the crown of flowers to conceal this defect from the beauties of Rome. At Athens as at Rome, no one could present himself in public without his crown.

At the present day there is an evident inclination to return to the better customs of Greece and Rome, and no fashionable lady can present herself respectably at a ball or an evening party without having a Rose or a Camellia in her breast. Let us hope that in a short time the crown and the bouquet will be rigorously enforced in every reunion which has pleasure for its object. Why should not our ladies abandon the ungraceful cap for the elegant and odoriferous crown of flowers? Flowers are, besides, the natural emblem of luxury, riches, and abundance. By and by we feel pretty sure they will replace the absurd cap, however costly it may be made.

In order to render this part of horticulture directly realizable, we shall pass on to the descriptions of head-dress in fashion, the first since 1847; the second during the present year 1851; and the third,

with some exceptions, at intermittent periods.

1. Coiffure à la Flore (Head-dress of Flowers).—This is suitable for those persons whose proportions and forms are of the most perfect character, and which come nearest the Grecian type. The profile



especially must be one of those which are commonly found represented on ancient bas reliefs. This head-dress is worn with the hair arranged in graceful wavy locks, the back being tied in a bunch, merely with a narrow band, and the ends floating down. The crown of flowers does not in this case form a diadem, but is tied in a knot behind, and at the lowest part of the head, from which point it gradually enlarges till it reaches the front, or the point immediately above the brow. This form of crown is composed of high-coloured flowers, as the Rose, Narcissus, Hyacinth, Camellia, Carnation, and sometimes an Or-

chid, and it is bordered with Ericas and distichous Cypress, terminating in leaves, with the more slender or fine parts of branches of flowers which take an upright, and, at the same time, a nodding form. The ancient ear-rings, and the string of pearls round the neck, harmonise admirably with this head-dress, which, invented more than a thousand years, is not the less handsome and in keeping with good taste. The figure (1) represents this form of head-dress taken from the Flore de Canova.

2. Coiffure à la Ceres (Head-dress of Cereals).—"This kind of head-dress," says M. Lachaume, "is worn with either even or wavy locks. It is very graceful, but only suitable for those ladies who have the head well proportioned. It should always be made in the form of a diadem in front, from the top of the brow. It is best formed (plaited) of the small flowers of Roses, or of Camellias, mixed with

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Violets, Pinks, &c. The Erica, or any very light foliage, is indispensable," We shall only add that nothing can be more graceful or appropriate than one or two spikes of Hordeum Zcocriton, H. hexastichon, Triticum monococcum, and other ornamental grains. They are used dry for this purpose, and decorated by means of gum with gold or silver in leaf. Ladies make elegant bouquets of these cereals, which last throughout the winter. Cereals for head-dresses should be sown in spring, and the goldenyellow spikes, when matured, have a charming effect among the flowers which have been already named. In winter the forced flowers of Pyrus japonica, as well as the Cœlestina, will be found very serviceable.

3. Coiffure à la Pomone (Head-dress of Fruit).—This form is chiefly suitable for those who have a large and robust figure, and a healthy high-coloured complexion. The crown is large, formed of fruits and leaves of the most select sorts. The top of the corset is also furnished with a garland formed in a similar manner. This style of ornament has many resources, which are much ignored by artistes. The pretty red berries of Ardisia crenulata have a fine effect, resembling bunches of coral beads, and which may be obtained during the whole winter in our stoves. The short-fruited spikes of Chamærops humilis are equally desirable, and may be as readily obtained. Many of the Common Thorn or Cratægus, also furnish abundant resources. The white berries of the Mistletoe (Viscum album) with their leathery leaves, which do not soon fade, are excellent for this purpose, as well as the pearly berries of Rhipsalis. Besides many varieties of natural fruits, imitations in glass, especially small bunches of Grapes, are very effective.

### A PLANT MORPHOLOGICALLY CONSIDERED.\*

BY THE REV. DR. M'COSH, OF BRECHIN.

CCORDING to the common idea, a Plant is composed of two essentially distinct parts, the stem and the leaf. The axis of the embryo proceeds downward and upward simultaneously, the descending axis being the root, and the ascending one the stem or trunk. Upon these axes others are formed as subterranean or aërial branches. The leaf is formed upon the ascending axis, and besides its common form, it assumes, while obeying the same fundamental laws, certain other forms, as in the sepals, the petals, the stamens and pistils. This makes a plant a dual, or composed of two essentially different parts. But to us it appears possible to reduce a plant by a more enlarged conception of its nature to an unity. According to our idea, it consists essentially of a stem sending out other stems similar to itself at certain angles, and in such a regular manner, that the whole is made to take a predetermined form. The ascending axis, for instance, sends out at particular normal angles in each tree, branches similar in structure to itself. These lateral branches again send out branchlets of a like nature with themselves, and at much the same angles. The whole tree with its branches thus comes to be of the same general form as every individual branch, and every branch with its branchlets comes to be a type of the whole plant in its skeleton and outline.

Taking this idea of a plant along with us, let us now enquire whether there may not be a morphological analogy between the stems and the ribs or veins of the leaf. As these veins are vascular bundles, proceeding from the fibro-vascular bundles of the stem, they may be found to obey the same laws. Physiological confirmations of this presumption may be found in the following circumstances:—
(1.) Both stem and vein are capable of becoming a spine, the stem as in the Thorn, the vein as in the Thistle. (2.) It is also an unsettled question whether the inflorescence and seed vessels in many cases are formed out of metamorphosed leaves or metamorphosed branches. The very fact that there is such a dispute shows that there is an analogy between leaf and branch. (3.) The vein of the leaf is capable

equally with the stem of producing a leaf bud, as in Bryophyllum and Gloxinia.

We begin with the examination of those plants which have a fully veined or reticulated leaf, and here we shall find a morphological analogy between the leaf and the branch, and the leaf and the whole plant. It should be noticed that this resemblance can be observed only when both the stems and the veins are fully and fairly developed. Let us first inspect in a general way the leaf of a tree with its central vein or veins, and its side veins. Even on the most careless inspection, the central vein will be found to bear a striking analogy to the central stem or axis of the tree, and the side veins to the branches. Let us then look at the tree when stript of its leaves in winter, and we shall see how like it is in its contour and skeleton to the contour and skeleton of a leaf. We shall be particularly struck with this if we view it in the dim twilight or the "pale moonlight" between us and a clear sky. In both leaf and tree we see a central stem or stems with ramified appendages going off at certain angles, and we may observe that the tree in its outline tends to assume the form of a leaf.

The general impression produced by a first glance will be confirmed on farther inspection. The

\* Read to the Botanical Society of Elinburgh, 10th July, 1851.

analogy between the skeleton of the leaf, and the skeleton of the branch, may be seen in a number of points as well as in the general resemblance between the ramification of the plant and the ramification of the venation of the leaf. (1.) Some trees, such as the Beech, the Elm, the Oak, the Holly, the Portugal and Bay Laurels, the Privet, the Box, will be found to send out side branches along the axis from the root, or near the very root, and the leaves of those trees have little or no petiole or leaf stalk, but begin to expand from nearly the very place where the leaf springs from the stem. There are other trees, as the Common Sycamore (the Scotch Plane Tree), the Peach, the Chestnut, the Pear, the Cherry, the Apple, which have a considerably long unbranched trunk, and the leaves of these trees will be found to have a pretty long leaf stalk. (2.) Most of our low-branching herbaceous plants, such as the Mallows, Rhubarb, Tussilago, Marsh Marigold, Lady's Mantle, Hollyhocks, send out a considerable number of stems from near the root, and it will be found in exact accordance with this, that those set off from the base of the leaf, a considerable number of main veins or ribs, which, as they spread, cause the leaf to assume a rounded shape. In these plants, the morphological resemblance between tree and plant is seen horizontally and not vertically. In this respect these plants are different from our forest trees, which send up commonly one main axis with lateral branches, and have in their venation one leading vein with side veins, (3.) Some trees, such as the Beech, the Birch, the Elm, send up one large main stem, from which, throughout its length, there proceed comparatively small branches, pretty equal along the axis, and it will be found in such cases that the leaf has a central vein with pretty equally disposed veins on either side. Other trees again tend rather to send off at particular heights a number of comparatively thick branches at once. This is the case, for instance, with the common Sycamore, the Chestnut, and the Laburnum. The trunk of the Sycamore (Acer Pseudo platanus), about eight or ten feet above the surface of the ground, commonly divides itself into four or five large branches, and, in precise analogy, we find the leaf at the top of a pretty long leafstalk sending off four or five large veins. The Chestnut tends to send off at the top of the unbranched trunk a still greater number of branches; and we find, in correspondence with this, that its leaf is commonly divided into seven leaflets. The Laburnum (and also the Broom and Clover) goes off in triplets in respect of leaflet and ramification. In such cases it will commonly be found that the leaf is compound; and we are to regard all such compound leaves as one and representative of the whole tree. Generally, it is the whole leafage coming off at a given place which represents the whole tree, and the single leaf, when there is a number of leaves, represents merely the branch. (4.) Some plants, such as the Rhododendron, the Azalea, and the Lupine, send off leaves which have a tendency to become whorled, and their branches have also a tendency to become verticillate. (5.) The stems of some trees, such as the Thorn and Laburnum, are not straight, and the branches have a twisted form; and it will be found that the vein of the leaf of these trees is not straight, and that the leafage is not in one plane. This is also seen in the Elm. (6.) In some trees, such as the Beech, the stems go off in nearly straight lines, and the leaves are found to have a straight venation. In other trees again, such as the Chestnut, the branches have a graceful curve, and the veins of the leaves are curved in much the same way. (7.) In most plants the angle at which the side stems go off will be found to widen as we ascend to the middle, and thence to decrease as we ascend to the apex, and the venation of the leaves will be found to obey a similar law. This helps to give both to tree and leaf their beautiful oval outline. In some plants again, such as the Poplar and Birch, the angles are widest at the base, and tend to narrow as we ascend; and both leaf and tree in such cases assume a kind of triangular form. (8.) Generally we shall find a correspondence between the angle of the ramification of the tree and the angle of venation of the leaf. We have made a sufficient number of measurements to be able to say that there is often such a correspondence. But it should be acknowledged, that while it is not difficult to determine the angle of the venation of the leaf, it is most difficult to determine what is the normal ramification of the tree, for the angle at which the branch goes off is liable to be modified by a great number of circumstances. All that we argue for is a general correspondence between the tendency of the direction of the branches and the tendency of the direction of the veins of the leafage; a tendency liable, however, to be affected by a great number of circumstances, natural and artificial. It is always to be remembered, that it is the whole leafage coming out at a given place, which represents the tree; and the single leaf, where there are more leaves than one, represents the branch or the young tree. It is only thus that I can bring the Ash and Mountain Ash into accordance with these views. The whole leafage with its stalk represents the tree, and the leaf branch and leaflet the branches and branchlets, as also the young tree.

Such facts as these strongly incline us to the belief, that in plants with leaves that strike the eye, the leaf and plant are typically analogous. The leaf is a typical plant or branch, and every tree or branch is a typical leaf. I am quite aware of the differences between these two distinct members of

the plant. In particular, we find in the case of the full tree, that the branches extend all round the axis, whereas in the leaf the fibrous veins all lie in one plane. But then we have a phenomenon to connect these two in the branch, the branchlets of which often lie in one plane. The principal difference between the tree and leaf may probably be found to be in this—that the cellular tissue or parenchyma, which in the tree and its branches is collected into the pith and bark (which are connected by the medullary rays) is in the leaf so spread out as to fill up the interstices of the fibrous matter which forms the veins.

The general order as thus stated applies only to the plants which have pith and bark, and fully formed leaves intended to strike the eye. There is no such special order in plants with linear, unbranched leaves, such as Firs and Pines. The leaf in these plants has no ramified venation, and seems to correspond, not to the whole tree, but to the stem, and in doing so it is more in accordance with the whole morphology of the tree than a veined leaf could possibly be. But while the general order is varied to suit the different physiological structure and form of the tree, we discover here the very same general principles of order as we have been discovering elsewhere; for in the Firs and Pines every internode is of the same structure with every other; every branch tends to assume the outline of the whole tree, every topmost or growing internode with its leafage is of the same form as the tree or branch. Herein does the special morphology approach nearest to that of the plants with ramified veins, and the very cones are often types of the whole tree and of every branch.

We are not prepared to say what is the special law of order in plants of the monocotyledonous class. Some of these, such as our ordinary Lilies and Grasses, send off no branches, and the leaves of these plants, have their veins parallel or nearly parallel to the stem, and have no ramified venation. In regard to Palms, they would require to be investigated in their native climes, before their special order could be discovered. Some plants of this class, the Dictyogens of Lindley, to which belong the yams, have branches like our ordinary forest trees, and it is a curious circumstance and confirmatory of our theory, that the leaves of these plants have a reticulated structure. So far as fungi, lichers, algae, and the whole acotyledonous plants are concerned, it is evident that they present a repetition of parts homotypal in structure and form, and thus illustrate one general doctrine—that throughout the vegetable kingdom the parts are similar to one another, and in nice accordance with the whole.

Such facts as the above incline us to the belief that the fibrous veins of the leaf bear a morphological analogy to the stems of the tree. We are inclined to regard the root, the stem, and the leaf as the three distinct members of the fully-developed plant, these three parts, however, being morphologically allied, so that, to adopt the phraseology of Professor Owen, as applied to another subject, they may be called Homotypes. The plant thus becomes an unity with innumerable interesting diversities.

I think it proper to add that while strongly convinced that there is truth in this doctrine, I am at the same time prepared to believe that it may have to submit to modification, which may correct, but will not destroy, the general view.

### NOTES CULTURAL, CRITICAL, AND SUGGESTIVE.

Nocera Onion, (Oignon de Nocera).—This is a small silver-skinned and very early variety. The seeds were received from Italy in 1840 by M. Audot, and when sown in a bed near another sort known as Oignon blane hâtif, it was found to be a full month earlier. It much resembles, in general form and size, the common Turnip-Radish; the under part is white, and the shoulder being more or less green, the whole surface is prettily streaked with green and light brown. If not identical with the true Petit Oignon blane de Florence, which has for a long time been out of cultivation, it is very nearly allied to that variety. It is certainly a very desirable sort, and excellent for pickling, but has not been found to keep well in France. It is, however, extensively grown for the market of Naples in the small town of Nocera, near Vesuvius, whence its name has been derived.—Revue Hort.

Climate of Natal.—According to Krauss, Natal is well watered by numerous rivers, which arise in the coast chain Quathlambra; these mountains are nearly 10,000 feet high, and run through the coast country of the new colony in every direction. The vegetation springs up in September; and during the months of October, November, and December, corresponding with the atmospheric precipitations, attains the greatest splendour. During this moist season the thermometer varies between 19° and 31° Centigrade [66° and 88° Fahrenheit]. Vegetable life is suddenly arrested as early as January; the grass plains appearing dark yellow, and the forests flowerless and uniformly green. Rain seldom falls from January to March; the air during this period is hot and oppressive, and the temperature between 26° and 32°.5 Centig. The same appears to be the case with the two following

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months, which Krauss did not spend in Natal. July and August are fine, the days hot (as high as 31°), but cool in the morning and evening; the thermometer, however, seldom falling so low as 15° Centig. [59° Fahrenheit]. A changeable, windy, and disagreeable period begins in September, the precursor of the rain. From these statements, the course of the seasons is the same as in the East Indies, except that the rainy season of three months occurs during the spring in the southern hemisphere, i. e., three months later than in the former.—Ray Reports.

Culture of the Vine (Reeve and Benham).—A new work has recently been issued from the press by Mr. John Sanders, gardener to T. A. Smith, Esq., of Tedworth, and though it does not contain any very startling novelties, the directions are plain and practical, and such as might be expected from a man who has evidently devoted more attention to the routine than to the theory of Grape management. The directions may be followed without any fear of the result, as Mr. Sanders' success sufficiently testifies, but whether the practices recommended are quite unexceptionable, is open to very considerable doubt. The errors, however, are those of omission rather than commission, and have arisen from the author presuming too much upon the knowledge of his readers. Thus the important matter of planting the Vine is discussed (p. 5) in some half score of lines, and not one word is said of the method of planting, as to whether the ball is to be put in entire, or whether the proper plan of spreading the roots carefully out is to be followed. Nothing is said of deep or shallow planting, so that the uninitiated who take Mr. S. for a guide, may plant the balls entire a foot deep, or they may spread the roots carefully out a few inches below the surface of the border if they happen to think they ought to do so. Autumn planting is recommended, but whether autumn may be the first of August, or the thirty-first of October, we are not informed. If the latter we object entirely, for we see no philosophy in submitting healthy roots to a cold border in a dormant state, when they might be protected in pots, as nothing is gained by it, and some risk is run of the young and the tender spongioles being destroyed before the growth of spring commences, and thus a quantity of roots which ought to spread and ramify from the front wall of the house, would be lost for ever. Again, under protection of borders, Mr. S. recommends (p. 10) "leaves of hard-wooded forest trees, such as Oak, Beech, &c., which have been previously collected in a large heap, and well trampled together, which soon become heated, and settle into solid masses. In using these leaves, take from the centre of the heap those which are the driest and most firmly cemented together, and in as large pieces as possible, and from four to six inches thick. Begin by forking the surface of the border lightly over, and when the earth is thus loosened, the masses of leaves should be laid entirely over the border, lapping one over the other on the same principle as the roof of a house is slated, for the purpose of preventing the rain penetrating." Over these flaky leaves six inches of loose ones are laid, and two or three inches of fine soil, to make all neat and clean. This, no doubt, is a very good plan, but hundreds of Grape growers around the metropolis would, like ourselves, exclaim, "where are the leaves to come from?" Flakes of Californian gold would be almost as acceptable to suburban gardeners; in fact, they could not be produced. Yet Mr. S. recommends no substitute! We are not told whether the Vine border should be covered in the autumn to prevent the escape of heat or not; but we are rather led to infer that the covering is not applied until just before forcing commences, for Mr. S. remarks, "before any internal heat is applied to the Vines proceed with borders as follows," &c. &c.; and hence it appears the borders are left exposed to the chilling rains of winter, and are covered just as forcing commences. This is a doctrine not generally received by our best forcing gardeners; they prefer the prevention of the escape of heat in the autumn, at least few of them like to expose the borders of their early houses to the drenching rains of winter, and hence protect them in the autumn. Mr. S. either does not follow the general plan, or has failed to say so. These are grave omissions, and though they might be pardonable in a periodical essayist, are scarcely so with one who assumes the responsibility of a public instructor. The work is illustrated by nine engravings, explanatory of the formation of houses, the pruning of Vines, &c., and the subject of Vine culture is discussed in four chapters-viz., "Culture of the Vine under Glass;" Culture of the Muscat Grape;" "Culture of the Vine in the Open Air;" and "Culture of the Vine in Pots;" each chapter, notwithstanding the drawbacks alluded to above, contains a mass of very useful and evidently practical information, which may be studied with profit by most Grape growers. The subject, however, of Vine management is by no means exhausted, and we regard Mr. Sanders' little treatise more as a contribution towards the proper history and management of the Vine than as being complete in itself.-A.

Grouping Trees in Parks.—The late Mr. Gilpin had a very good plan of forming groups in parks; he first determined on the positions where two, three, or more would be effective, and not far from each other; he planted these with trees of the desired kind, and of a permanent character, and then enclosed a rectangular figure around them, filling up all the intervals with trees of very rapid growth,

and with Gorse, Broom, &c., as nurses.





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### GREVILLEA LAVANDULACEA.

Nat. Order .- PROTEACE E.

GENERIC CHARACTER. - Grevillea, R. Brown. - Perigone four-leaved or four-parted, irregular, the lobes somewhat spathulate, recurved, revolute. Anthers four, immersed in the concave apices of the lobes of the perigone. Hypogynous gland solitary, halved. Ovary sessile or stalked; one-celled, with two ovules. Style ascending; stigma oblique and depressed, or subvertical and conical. Follicle leathery or woody, onecelled, two-seeded. Seeds margined, or with a short wing at the summit.-Shrubs or trees, occurring throughout New Holland, often with pubescence, which, when present, consists of hairs fixed by their middle; leaves alternate, undivided, or pinnatifid and bipinnatifid; cutaneous glands attached by their bases, or, more rarely, all round; spikes sometimes elongated and racemose, sometimes abbreviated and corymbose, or fasci-

| culiform; pedicels in pairs, or rarely several together, the pairs or the fascicles subtended by a single bract; perigone reddish or yellow; in some cases inserted obliquely .- (Endlicher Gen. Plant., 2143.)

 ${\tt Grevillea\ Lavandulacea}, \textit{Schlechtendahl.} - {\tt Lavender-like}$ Grevillea .- Clothed all over with somewhat adpressed hoary hairs; leaves linear-oblong, rather acute, mucronate or cuspidate, the margins slightly or tightly revolute (hence they are commonly terete), finally punctate, scabrous on the upper side. whitish hoary beneath; racemes terminal, few-flowered, erect; style rather hairy, almost twice as long as the calyx; stigma lateral oblique, concave, glabrous.

SYN.-G. lavandulacea, Schlechtendahl, in Linnæa, xx. 586.

ESCRIPTION.—A stiff erect shrub, with diverging branches terminating in inflorescence, clothed with somewhat adpressed hairs. The leaves are scattered, linear-oblong, about three quarters of an inch long, the margins truly revolute, not angularly folded; the lower face whitish and silky, the upper green, finally punctate, scabrous, the point armed with a mucro. Flowers collected in tufts at the ends of the branches, stalked, the peduncles short and hairy; the perianth hairy, half an inch long, rose-coloured; overy slightly stalked, hairy; style (with the ovary) one inch long, attenuated gradually to the summit, where it again expands into a spoon-shaped stigma, rendered lateral by the curvature of the summit of the style.—A. H.

History, &c.—This very pretty greenhouse shrub was raised by Messrs. Henderson of the Pinc Apple Nursery, Edgeware Road, from seeds transmitted from the Swan River settlement by Mr. Drummond. It flowered with them very freely during the past spring, and was at that time exhibited, and much admired, at one of the ordinary meetings of the Horticultural Society. Our drawing was made from this plant. Its general aspect is that of G. rosmarinifolia, another very pretty species, now getting comparatively rare; but it is abundantly distinct, and much more elegant.-M.

CULTURE.—Like most of the other species, this plant is of easy cultivation; and the following treatment will suit it well:-Presuming you have an established plant, take it carly in the season, February or March, and shift it into a larger pot, into soil consisting of turfy peat, leaf-mould, and nice mellow loam, in about equal proportions, liberally intermixing the same with potsherds broken small, and gritty sand. Drain the pot thoroughly, and make the soil in potting tolerably fine. If it is wished to grow the plant rapidly, the best place to put it in will be a cool stove or warm greenhouse, supplying it sufficiently at the roots with water, and sprinkling it daily in warm weather over the foliage. As the plant progresses, stop the strongest shoots to make them branch, and pot as frequently as is necessary until you get a large plant. During the autumn, the plant will be best in the open air; and through August and September, to insure its blooming, it should be exposed to the full sun. As the plant, under proper management, is of good habit, it will not, when established, require much stopping; but should it get naked, do not hesitate to cut it boldly in, give it a liberal shift, and start it into fresh growth. The Grevilleas are increased by cuttings of the halfripened wood, and also by seed. The seed may be sown any time between February and October, and must be placed in a gentle heat until it begins to grow. The cuttings must be kept under a bell-glass, and in a cool house, until they begin to cicatrise; and then they may be placed in gentle bottom heat until fit to pot off.—A.

### THE GENERA AND SPECIES OF CULTIVATED FERNS.

BY MR. J. HOULSTON, ROYAL BOTANIC GARDENS, KEW; AND MR. T. MOORE, F.L.S., &c.

Sub-order-Polypodiacee: Tribe-Asplenieæ (continued).

SPLENIUM, Linnaus.—Name derived from a, privative, and splen, the spleen; from some supposed medicinal virtues in affections of the spleen.

Sori linear, oblong or elongated, simple, unilateral, on the superior side of the veins or venules. Indusium linear, plane or vaulted, and cylindrical. Veins forked or pinnate; venules direct, free. Fronds simple, pinnate,

or bi-tri-pinnate, from a few inches to two or three feet long; usually glabrous, rarely pubescent.—A great number of species are included in this genus, from the circumstance of the same characters being developed throughout the whole, that is, simple or forked free veins, and simple sori; and although aspect and habit would seem to indicate that some natural divisions might be made with advantage, yet these divisions so gradually merge into each other, that we fear any attempt at generic distinction would be opposed to nature, and would tend only to confusion. A few species having their pinnæ divided into small segments, with a sorus usually on each, opening outwards, constitute the genus Darea of Willdenow; another group having the sori short, and the indusium fringed,

form the Athyriums of Roth; and a third section is constituted of the species of Acropteris of Link. Other groups might claim to be separated on equally just grounds, if these were tenable. We have therefore thought it best to retain them as one group, which has been broken up into sections for convenience of reference. Fig. 48 represents a pinna of A. lucidum (nat. size).

### ¿ Euasplenium.

- 1. A. serratum, Linnæus.—An ornamental evergreen stove Fern, from Jamaica and Trinidad. Fronds glabrous, simple, broadly lanceolate, two feet long and four inches wide, rather membranous, bright green, and serrate at the margin. The fronds in this species are arranged similar to those of Neottopteris vulgaris. Stipes one inch long, scaly; terminal, adherent to an erect rhizome.
- 2. A. brasiliense, Swartz (A. Nidus, Raddi; A crenulatum, Presi).—An ornamental evergreen stove Fern, from Brazil, and various parts of South America. Fronds glabrous, simple, coriaceous, elongate-lanceolate, from two to three and a half feet long, deep green, slightly undulated, viviparous at the apex, decurrent at the base, sub-entire at the margin. Stipes one inch long, scaly; terminal, adherent to an erect rhizome.
- 3. A. palmatum, Lamarck.—A dwarf evergreen warm greenhouse Fern, native of the South of Europe, Madeira, the Canaries, Azores, &c. Fronds simple, glabrous, ten inches high, bright green, coriaceous, five-lobed, acute, middle lobe longest, cordate at the base, entire at the margin; terminal, adherent to a thick creeping rhizome.
- 4. A. oligophyllum, Kaulfuss.—An ornamental evergreen stove Fern, from Brazil. Fronds glabrous, coriaceous, a foot or more long, pinnate, bright green; pinnæ oblong-lanceolate, cuneate at the base, crenate-serrate at the margin. Rachis winged. Stipes scaly, terminal, adherent to a somewhat creeping rhizome.
- 5. A. elongatum, Swartz (A. caudatum, Cavanilles).—A very beautiful evergreen stove Fern, native of Java and the Philippine Islands. Fronds glabrous, pinnate, one foot and a half long, deep green; pinnæ oblong-obtuse, round at the apex, superior base auriculate, inferior truncate, crenate at the margin, terminal one elongated, and serrate. Rachis marginate. For cultivated specimens of this plant we are indebted to Messrs. Veitch and Son, of Exeter, by whom it has been imported.
- 6. A. lucidum, Forster.—An ornamental evergreen, greenhouse species, from New Zealand. Fronds glabrous, lanceolate, one and a half to two feet long, bright shining green, coriaceous, pinnate; pinnæ oblong-acuminate, petiolate, cuneate at the base, serrate at the margin. Fronds terminal, adherent to a scaly thick creeping rhizome.
- 7. A heterodon, Blume (A.prionurus, J. Smith).—An evergreen stove Fern, from the East Indies. Fronds rather erect, glabrous, shining, bright green, pinnate, a foot and a half long, viviparous near the apex; pinnæ oblong, undulate, slightly deflexed, petiolate, cuneate at the base, the apex sub-caudate and serrate. Fronds terminal, adherent to a rather erect rhizome.
- 8. A. compressum, Swartz.—An ornamental evergreen greenhouse Fern, from St. Helena. Fronds glabrous, ovate-lanceolate, shining, bright green, one and a half to two feet long, coriaceous, pinnate; pinnæ broad, nearly all viviparous, oblong-acute, superior base truncate, and parallel with the rachis, sub-auriculate, inferior obliquely cuneate, bluntly serrate on the margin. Rachis winged. Fronds terminal, adherent to an erect rhizome.
- 9. A. obtusatum, Forster.—A rigid erect-growing evergreen frame or greenhouse Fern, native of New Zealand, New Holland, and Van Diemen's Land. Fronds glabrous, coriaceous, ten inches high, bright green, pinnate; pinnæ oblong-obtuse, rounded at the apex, cuneate at the base, bluntly and deeply serrate at the margin. Rachis winged throughout. Stipes scaly. Fronds terminal, adherent to a somewhat creeping rhizome.
- 10. A. lætum, Swartz.—An ornamental evergreen stove species, from the West Indies. Fronds glabrous, elongated, one and a half to two feet long, pinnate, bright green; pinnæ oblong-obtuse, lower pair longest, hastate, upper auriculate, superior base somewhat rounded, inferior truncate, round at the apex, inciso-serrate at the margin. Rachis winged. Stipes scaly at the base, terminal, adherent to an erect rhizome.
- 11. A. marinum, Linnæus.—An evergreen frame or greenhouse Fern, indigenous to Britain, and found in the South of Europe, the Channel Islands, Madeira, Teneriffe, and Northern Africa. Fronds glabrous, linear-lanceolate, pinnate, from eight to eighteen inches long, bright green; pinnæ oblong-obtuse, round at the apex, incisoserrate at the margin, superior base somewhat rounded and sub-auriculate, inferior truncate. Rachis winged. Fronds terminal, adherent to a short scaly, somewhat creeping rhizome.





12. A Hendersoni, J. H.—A singular-looking evergreen Fern, the native country of which is unknown. Fronds glabrous, elongated, eight inches long, pinnate below, upper part pinnatifid, or irregularly laciniated, light green; lower pinnæ cordate-hastate, elongate, obtuse, deflexed; middle pinnæ adnate, decurrent, entire at the apex, and often forked, margin entire. Stipes about three inches long, and thinly covered with long brown narrow scales.

A specimen of this singular Fern was communicated to us by Mr. Henderson, Gardener at Wentworth House, Yorkshire. It was raised by him from spores some years ago, but from what country imported it is not known. It appears to maintain its singular character constant in cultivation; but as nothing corresponding with it can be found in the extensive herbaria of Mr. J. Smith, or Mr. R. Heward, it has been suggested that it is not a distinct species, but a singular form degenerated from some other kind, however different it may now appear.

13. A. angustifolium, Michaux.—A rather rugose-looking deciduous hardy Fern, from North America. Fronds glabrous, slender, lanceolate, one and a half or two feet long, pinnate, pale green; pinnæ linear-lanceolate cordate at the base, sub-auriculate, petiolulate, undulate, membranous and slightly crenulate at the margin. Fronds

terminal, adherent to a creeping rhizome.

14. A. comptum, Kunze (A. rhizophorum, Swartz). — An evergreen stove species, from Jamaica. Fronds glabrous, linear-lanceolate-elongate, pinnate, one and a half foot long, deep green; pinnæ oblong-obtuse, inferior ones petiolulate, blunt at the apex, upper base sub-auriculate, inferior obliquely truncate, bluntly serrate on the margin. Stipes and rachis ebeneous, void of pinnæ on the apex, and rooting at the point. Fronds terminal, adherent to a fasciculate erect rhizome.

15. A. salicifolium, Linnæus.—An evergreen stove Fern, from Jamaica. Fronds glabrous, pinnate, a foot or more long, light green; pinnæ oblong-petiolate, blunt at the apex, upper base somewhat round, and sub-auriculate, lower cuneate, crenate-dentate on the margin. Fronds terminal, adherent to a somewhat creeping rhizome.

16. A. pulchellum, Raddi (A. curvatum, Swartz).—A dwarf evergreen stove Fern, from Brazil and the West Indies. Fronds glabrous, slender, linear-lanceolate, ten inches long, dull green, pinnate; pinnæ oblong-obtuse, petiolate, sub-falcate, round at the apex, superior base auriculate, inferior truncate-dimidiate, inciso-serrate on the margin. Sori oblong linear, of a bright brown colour. Fronds terminal, adherent to a fasciculate rhizome.

17. A. dentatum, Linnæus.—A dwarf evergreen stove Fern, from the West Indies. Fronds glabrous, pinnate, six inches long, light green; pinnæ obovate-oblong, obtuse, cuneate at the base, and deeply dentate on the margin.

This species, which was introduced by Messrs. Loddiges some years ago, is now scarce in cultivation.

18. A. flabellifolium, Cavanilles.—A very slender creeping evergreen warm greenhouse Fern, from New Holland and Van Diemen's Land. Fronds glabrous, linear, a foot or more long, pinnate, bright green; pinnæ small, fan-shaped, petiolate, sharply dentate on the margin; rachis filiform, elongate, void of pinnæ on the apex, and rooting at the point. Fronds terminal, adherent to a small fasciculate rhizome.

19. A. radicans, Swartz (Diplazium, Prest).—A beautiful evergreen stove species, from Jamaica and Cuba. Fronds glabrous, elongate triangular, a foot and a half long, void of piunæ on the apex, and rooting at the point; bipinnatifid, light green; pinnæ elongate, acute or acuminate, obtusely cuneate at the base; segments ovate-obtuse, largest next the rachis, slightly crenate on the margin. Rachis and stipes ebeneous; terminal, adherent to a fasciculate rhizome.

20. A. pumilum, Swartz.—A dwarf evergreen stove species, a native of the West Indies and the Philippine Islands. Fronds triangular, hairy, ternate-bipinnatifid, a few inches high, membranous, of a pale green; lateral pinnæ sub-tripartite, intermediate one longest, acute, with roundish crenate lobes; indusium hairy. Fronds terminal, adherent to a somewhat creeping rhizome. This very delicate little species has been but recently introduced to English gardens from the continent.

### { TRICHOMANES.

- 21. A. Trichomanes, Linnæus.—A very elegant dwarf hardy evergreen Fern, indigenous to Britain and found throughout Europe, Asia, and North America. Fronds linear, pinnate, from four to ten inches long, deep green; pinnæ numerous, irregularly ovate, obtuse at the apex, crenate at the margin, truncate-cuneate at the base, and articulated with the rachis. Rachis and stipes shining, of a purplish black colour; terminal, adherent to a tufted rhizome.
- A. Trichomanes,  $\beta$  incisum.—Fronds linear, pinnate, about six inches long; pinnæ numerous, deeply and irregularly pinnatifid; segments linear, bluntly toothed at the margin. This variety is found in Yorkshire and at Kantelough near Burnley in Laneashire; a similar one has been found in Devonshire. It retains its peculiar character in cultivation, but is invariably without fructification.
- 22. A. monanthemum, Smith (A. monanthes, Linnaus).—A very beautiful evergreen greenhouse Fern, a native of the West Indies, Peru, and Cape of Good Hope. Fronds glabrous, linear-lanceolate, one foot long, bright green, pinnate; pinna oblong, dimidiate, sub-imbricate, round at the apex, articulate with the rachis, inferior ones flabellate, upper base parallel with the rachis, lower truncate, crenate-serate on the apex and upper margin. Sori linear, solitary, or occasionally two on a pinna, horizontal, situate near the inferior margin. Rachis and stipes ebeneous; terminal, adherent to a somewhat tufted rhizome.
- 23. A. dimidiatum, Swartz (A. formosum, Hort).—An elegant evergreen greenhouse species, from the West Indies. Fronds glabrous, slender, linear-lanceolate, a foot long, light green, pinnate; pinnae oblong, sub-imbricate, petiolulate, articulate with the rachis, round at the apex, superior base parallel with the rachis,

### THE GENERA AND SPECIES OF CULTIVATED FERNS.

inferior obliquely truncate, serrate at the margin. Sori linear, five or six pair on each pinna. Rachis and stipes winged, ebeneous; terminal, adherent to an erect fasciculate rhizome.

24. A. ebeneum, Aiton.—A beautiful neat evergreen greenhouse Fern, native of the Cape of Good Hope, Mexico, and North America. Fronds glabrous, linear-lanceolate, a foot or more long, light green, pinnate; pinnæ sub-sessile, imbricate, oblong, inferior ones cordate-hastate, superior auriculate, round at the apex, obtusely crenate at the margin. Rachis and stipes ebeneous; shining, pubescent; terminal, adherent to a tufted rhizome.

25. A. mutilatum, Kaulfuss.—A beautiful evergreen warm greenhouse Fern, from the Cape of Good Hope. Fronds glabrous, slender, one foot long, pinnate, light green; pinnæ membranous, oblong-acuminate, petiolulate, inferior ones hastate, superior auriculate, cuneate at the base, inciso-serrate with segments acute. Rachis winged throughout. Fronds terminal, adherent to an erect fasciculate rhizome. This species has been in cultivation since 1845.

26. A. viride, Hudson.—A neat little evergreen hardy or frame species, indigenous to Britain and found in all European countries. Fronds glabrous, linear-lanceolate, light green, from four to eight inches long, pinnate; pinnæ roundish ovate, generally alternate, petiolulate, cuneate at the base, obtusely crenate at the margin. Rachis and stipes green. Fronds often divided at the apex; terminal, adherent to a tufted rhizome.

27. A. Petrarchæ, Decandolle.—A delicate little evergreen greenhouse Fern, from the south of France. Fronds glandulose-pubescent, six inches long, light green, pinnate; pinnæ oblong, petiolate, pinnatifid with obtusely crenate segments. Stipes and rachis ebeneous, terminal; adherent to a tufted rhizome.

28. A. reclinatum, J. H.—A beautiful pendulous evergreen greenhouse species, from St. Helena. Fronds slender, glabrous, lanceolate, one foot long and rooting at the apex, dull green, pinnate; pinnæ membranous, oblong, slightly petiolate, round at the apex, superior base somewhat round and sub-auriculate, inferior truncate, obtusely crenate at the margin. Rachis winged throughout. Fronds terminal, adherent to a fasciculate erect rhizome. This species was introduced in 1847.

#### DAREA.

29. A. brachyopterum, Kunze.—A low-growing neat evergreen stove Fern, from Sierra Leone. Fronds glabrous, horizontal, linear-acuminate, eight or ten inches long, of a light green, and rooting at the apex, bipinnate; lower pinnæ rhomboidal, upper dimidiate, cuneate at the base, with obtuse linear segments, inferior one largest. Rachis and stipes channeled; terminal, adherent to an erect fasciculate rhizome. Sori oblong, solitary one on each segment. This species has been in cultivation since 1844.

30. A. flaccidum, Forster.—A pendulous evergreen greenhouse Fern, from New Zealand. Fronds elongate lanceolate, two and a half or three feet long, bi-tri-pinnatifid, deep green; pinnæ narrow elongate, pendulous, remote, viviparous, decurrent at the base, six or seven inches long; pinnules linear elongate, cuneate at the base, largest next the midrib; segments linear acute, distant and repand. Fronds scattered over beneath with minute dark cordate scales; terminal, adherent to a scaly somewhat creeping rhizome. We believe the A. odontites of New Holland to be identical with this species.

31. A. rachirhizon, Raddi (A. rhizophorum, Hort).—A very graceful evergreen stove Fern, native of Brazil and the West Indies. Fronds glabrous, rather ovate-elongate, one and a half to two feet long, void of pinnæ on the apex, and rooting at the point, bi-tripinnate, deep green; pinnæ lanceolate, often proliferous on the apex; pinnules rather ovate, obtuse; segments obovate-cuneate, obtusely crenate at the margin. Rachis and stipes ebeneous, shining, slightly winged; terminal, adherent to an erect fasciculate rhizome.

32. A. scanders, J. Smith.—An elegant evergreen stove Fern, from Java and the Philippine Islands. Fronds lanceolate, one and a half or two feet long, light green, bi-pinnatifid; pinnæ oblong, round at the apex, with linear obtuse segments. Rachis and stipes marginate, scaly. This species has been introduced by Messrs. Veitch and Son, to whom we are indebted for cultivated specimens.

33. A. bulbiferum, Forster. — An ornamental evergreen greenhouse Fern, from New Zealand. Fronds lanceolate, rather erect, one and a half to two feet high, light green, sub-tripinnatifid; pinnæ oblong acuminate, viviparous; pinnules rather ovate, largest next the midrib, cuneate at the base; segments linear acute. Fronds with the under surface scattered over with minute dark cordate scales; terminal, adherent to a thick somewhat creeping scaly rhizome.

34. A. appendiculatum, Presl (Cænopteris, Labillardiere; A. laxum, R. Brown).—An ornamental evergreen greenhouse Fern, from Van Diemen's Land. Fronds lanceolate, a foot and a half long, dull green, sub-tripinnate; pinnæ oblong, acute, the apex proliferous; pinnules rather ovate, cuneate at the base, segments acute. Sori oblong, becoming confluent, and covering the whole under surface. Rachis and stipes scaly, winged; terminal, adherent to a short somewhat creeping rhizome.

35. A. cicutarium, Swartz.—An elegant evergreen stove species, from Jamaica. Fronds glabrous, lanceolate, one to one and a half foot long, light green, tripinnate; pinnæ lanceolate; pinnules rather ovate, cuneate at the base, lowest one appressed to the midrib; segments linear acute. Rachis and stipes ebeneous, winged throughout; terminal, adherent to a fasciculate erect rhizome.

36. A. viviparum, Presl (Cænopteris, Bergius; Darea fæniculacea, Sieber).—An elegant little evergreen Fern, from the Mauritius. Fronds glabrous, ovate-lanceolate, one foot long, tripinnate, bright green; pinnæ oblong acuminate, apices viviparous, segments linear-filiform. Fronds terminal, adherent to a scaly somewhat creeping rhizome.

37. A. diversifolium, Allan Cunningham.—A very elegant evergreen greenhouse species, from Norfolk Island. Fronds glabrous, rather ovate-lanceolate, a foot and a half long, light green, tripinnate; pinnæ oblong-acuminate, decurrent at the base; pinnules linear-filiform, longest next the midrib; segments acute. Fronds terminal, adherent to a thick scaly creeping rhizome. The fronds in this species are very variable; some are all sterile, others all fertile, and others again intermediate; the sterile ones are bipinnate, with pinnules somewhat trapezioidal, or roundish ovate, cuneate at the base, and serrate at the margin.

### ¿ ACROPTERIS.

38. A. septentrionale, Hull.—A dwarf evergreen hardy or frame species, indigenous to Britain and found in most European countries. Fronds glabrous, a few inches high, dull green, bipartite; segments linear, occasionally bifid, acutely three-toothed at the extremity. Sori linear, longitudinal, subsequently becoming confluent and covering the entire segment of the frond, hence named by Linnæus Acrostichum septentrionale. Fronds terminal, often curved on the apex; adherent to a fasciculate tufted rhizome.

39. A. germanieum, Weiss (A. alternifolium, Wulfen; A. Breynii, Retzius).—A dwarf evergreen hardy or frame species, indigenous to Britain, and found in Germany, Switzerland, Italy, France, Hungary, and Sweden. Fronds glabrous, three or four inches high, pinnate, light green; pinnæ generally alternate, lanceolate cuneate

at the base, toothed at the apex, lower ones trifid; terminal, adherent to a tufted rhizome.

40. A. Ruta-muraria, Linnæus.—A dwarf evergreen hardy Fern, indigenous to Britain, and found throughout Europe and in North America. Fronds glabrous, from two to five inches high, somewhat triangular, bipinnate, especially below; pinnules obovate-cuneate, bluntly toothed at the margin; sori elongated, becoming confluent and covering the whole under surface. Indusium fringed at the margin. Fronds terminal, adherent to a tufted rhizome.

41. A. zamiæfolium, Willdenow.—An ornamental evergreen stove Fern, a native of Mexico, Hispaniola, and New Holland. Fronds rather ovate, glabrous, pinnate, a foot or more long, dull green; pinnæ large, oblong-dimidiate, coriaceous, acute, cuneate at the base, inciso-serrate at the margin, with acute segments. Stipes scaly; terminal, adherent to a rather erect rhizome.

42. A. furcatum, Thunberg.—A neat evergreen warm greenhouse Fern, from the Cape of Good Hope. Fronds ovate lanceolate, bipinnate, a foot or more long, light green; pinnæ oblong-acute; pinnules petiolate, broadly cuneate, inferior one three-lobed, middle lobe longest, apex serrate. Stipes densely covered with brown narrow scales, a few scattered on the rachis. Fronds lateral, adherent to a slender creeping scaly rhizome, about the size

of a goose quill.

43. A. præmorsum, Swartz (A. canariense, Willdenow; A. erosum, Hort.). — A beautiful evergreen warm greenhouse Fern, native of the West Indies, Teneriffe, Canary Islands, and New Holland. Fronds lanceolate or triangularly-elongate, bipinnate, light green, one and a half to two feet long; pinnæ elongate-acuminate, narrowed at the apex; pinnules remote, cuneate-lanceolate, three- or five-lobed, middle one elongate, margin inciso-serrate. Rachis and stipes densely covered with narrow brown scales; terminal, adherent to a thick creeping rhizome.

44. A. falcatum, Lamarck.—An ornamental evergreen stove Fern, a native of the East and West Indies, St. Helena, and New Holland. Fronds glabrous, oblong-lanceolate, pinnate, one to one and a half foot long, dull green; pinnate coriaceous, elongate-lanceolate, falcate, sub-auriculate, cuneate at the base, inciso-serrate at the margin. Rachis and stipes scaly; terminal, adherent to a short creeping rhizome. Two forms of this species

are in cultivation, one from Jamaica, the other from Madeira.

45. A. polyodon, Forster.—An ornamental evergreen greenhouse Fern, from New Zealand. Fronds glabrous, lanceolate, pinnate, two feet long, deep green; pinnæ trapeziod-elongate, acuminate, petiolate, obtusely cuneate at the base, doubly serrate at the margin. Rachis and stipes scaly; terminal, adherent to a creeping rhizome.

46. A. serra, Langsdorf et Fischer.—A very beautiful evergreen stove Fern, from Brazil. Fronds lanceolate, two to two and a half feet long, pinnate, deep green; pinnæ drooping, lanceolate-elongate-acuminate, coriaceous, petiolate, upper base round, inferior cuncate, deeply serrate on the margin. Sori linear, near the costa. Rachis and stipes densely covered with narrow brown scales; terminal, adherent to a thick scaly creeping rhizome.

### ₹ ADIANTUM-NIGRUM

47. A. fontanum, R. Brown (Aspidium, Willdenow; Polypodium, Linnœus; Aspidium Halleri, Willdenow).

— Λ very neat dwarf hardy Fern, indigenous to Britain, and found more or less distributed throughout Europe. Fronds glabrous, rather narrow, rigid, lanceolate, bipinnate, three to six inches long, deep green; pinnæ oblongovate; pinnules small, obovate-cuneate, with a few large deep mucronate teeth. Rachis winged throughout. Stipes with a few scaly hairs at the base; terminal, adherent to a tufted rhizome. Sori becoming confluent, and covering the whole under surface of the frond.

48. A. lunceolatum, Hudson.—A very beautiful evergreen hardy or frame species, indigenous to Britain, and found in Madeira, the Channel Islands, Hungary, Bohemia, and South America. Fronds glabrous, lanceolate, from six inches to a foot long, bipinnate, bright green; pinnules obovate, attenuated at the base, deeply and sharply toothed; lower pinnar somewhat lobed. Principal rachis slightly winged. Stipes scaly at the base, terminal, adherent to a tufted rhizome.

49. A. Adiantum-nigrum, Linnaeus.—An ornamental evergreen hardy Fern, indigenous to Britain, and found

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in every country of Europe except Spain; likewise in Madeira and Carolina. Fronds somewhat triangular elongate, from a few inches to a foot or more high, light green; inferior pinnæ tripinnate, superior sub-tripinnate; pinnules ovate-lanceolate, inciso-pinnatifid, bluntly or acutely toothed at the margin. Principal rachis winged. Stipes blackish with a few scattered scales at the base; terminal, adherent to a tufted rhizome.

50. A. acutum, Bory.—An ornamental evergreen hardy or frame Fern, from Teneriffe. Fronds glabrous, triangularly-elongate, a foot long, dark green, bi-tripinnate; pinnules oblong-lanceolate, inciso-pinnatifid, with acute dentate or bidentate segments. Rachis winged. Fronds terminal, adherent to a somewhat tufted rhizome. This is probably a more developed form of A. Adiantum-nigrum, although retained in catalogues as a distinct species.

51. A. auritum, Swartz.—An evergreen stove Fern, from the West Indies. Fronds glabrous, triangularly elongate, one foot long, light green, pinnate; pinnæ bipartite, inferior segments cuneate, serrate at the margin, ultimate one pinnatifid, inciso-serrate, and cuneate at the base. Rachis winged. Fronds terminal, adherent to a somewhat tufted rhizome.

52. A. planicaule, Wallich.—An ornamental evergreen stove Fern, from the East Indies. Fronds slender, glabrous, triangularly elongate, one to one and a half foot long, bipinnate, deep green, pinnules remote, oblong-cuneate, acute, one next the rachis largest, decurrent at the base, and serrate at the margin. Stipes and rachis dark coloured; rachis winged. Fronds terminal, adherent to a somewhat tufted rhizome.

### § ATHYRIUM.

53. A. pubescens, J. H.—An evergreen half hardy or greenhouse Fern; its native country is supposed to be North America. Fronds pubescent, lanceolate, a foot and a half or two feet long, pinnate, light green; pinnæ lanceolate, deeply pinnatifid, with oblong-linear, rather obtuse segments. Sori short, linear, except near the apex of the frond, where it becomes arched. Indusium hairy. Fronds nearly all fertile, with a few scales at the base of the stipes; terminal, adherent to an erect fasciculate rhizome.

54. A. Filix fæmina, Bernhardi (Aspidium, Swartz; Polypodium, Linnæus; Athyrium, Roth).—A very elegant, feathery hardy deciduous Fern, indigenous to Britain, and found throughout Europe, in Asia, Africa, and North America. Fronds lanceolate, one to two and a half feet long, light green, bipinnate; pinnæ linear lanceolate; pinnules linear-oblong, acute, inciso-serrate, one next the rachis largest, with bi- or tri-dentate segments. Stipes scaly at the base, with a few scattered on the rachis. Sori oblong, or reniform, especially the lower ones; indusium of the same shape as the sori, and divided at the free margin into capillary segments. Fronds terminal, adherent to a thick somewhat creeping rhizome.

This is the most variable Fern in cultivation. It bears oblong, or reniform, or arched sori, the latter produced principally on the lower parts of the pinnules, and these being analogous to those of Aspidieæ, some authors have placed it in that genus; but as the Aspidieæ are characterized by having punctiform, rarely oblong sori, never linear, as they mostly are in this species, nor lateral, as they always are here, it more closely agrees with the Asplenieæ. But it is not only variable in its primary characters, its outline, size, division, and density, are equally variable, and several widely-different forms, which are distinguished as varieties, are so totally unlike the type, that some of them may almost be regarded as distinct species.

A. Filix famina  $\beta$  convexum (Athyrium rhæticum, Roth).—Fronds lanceolate, bipinnate, semi-erect, one to two feet long, pale green; pinnæ linear-lanceolate; pinnules oblong-linear, very narrow, convex, with deflexed margins, bluntly toothed. Stipes scaly at the base, with some scattered on the rachis. Fronds terminal, adherent to a thick, short, somewhat tufted rhizome.

A. Filix famina \( \text{latifolium} \) (Athyrium latifolium, Presl? Babington MSS.!)—Fronds elongate-lanceolate, bipinnate, three or four feet high, dark green; pinnæ linear-lanceolate; pinnules ovate, flat, crowded, laciniate, with oblong-toothed lobes. Stipes and lower part of the rachis scaly. Sori distinct, in two rows, lunate. Found near Keswick by Miss Wright.

A. Filix famina & multifidum.—Fronds glabrous, ovate-lanceolate, one and a half foot long, semi-erect, light green; pinnæ lanceolate, with their apices as well as the apex of the frond, multifid, or tasselled. This is a very elegant variety, retaining its peculiar character, constant in cultivation. Sori somewhat crowded throughout the whole frond. Found in Ireland by Mr. D. Moore, who informs us that it comes true from the spores.

A. Filix famina & ramosum.—Fronds slender, glabrous, rather erect, one foot high, dull green, divided at the apex into numerous branching narrow rachiform segments; pinnæ small, unequal, and irregularly lacerated, with a blunt dentate margin. Sori small, chiefly occupying the pinnæ, and not the rachiform segments. This is a miserable-looking monstrosity, the fronds always appearing as if starved or stunted, but it is constant under cultivation. Found in Ireland by Dr. J. T. Mackay.

A. Filix famina & crispum.—Fronds glabrous, semi-erect, about a foot long, without any defined form, bright green, crisped; the rachis irregularly and unequally branched, with the apex of the divisions densely tufted or tasselled. Sori small, scattered through the whole under surface. This is the most distinct of all the varieties, and is constant; the fronds being rather leafy, and growing in a dense mass, have the appearance of a tuft of curled parsley. It was first discovered by Mr. A. Smith on the Hill Orah, in the county Antrim, and subsequently by Sir W. C. Trevelyan in Braemar.

55. A. Michauxii, Sprengel (Nephrodium Filix formina, Michaux).—A fragile hardy deciduous Fern, from North America. Fronds glabrous, ovate-lanceolate, from two to two and a half feet long, erectish, deep green, bi-tri-

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pinnatifid; pinnæ approximate, lanceolate, the lower six inches long; pinnules flat, distant, oblong-acuminate, largest next the rachis, with oblong-obtuse inciso-serrate segments, serratures sub-bidentate. Stipes, rachis, and midrib of pinnæ reddish while growing, but of a pale-straw colour when dry. Sori oblong, reniform, or sublunate, crowded; indusium fringed on the free margin. Fronds terminal, with a few scattered scales on the stipes; adherent to a creeping rhizome.

### § ALLANTODIA.

56. A. Brownii, J. Smith (Allantodia australis, R. Brown).—An ornamental evergreen warm greenhouse Fern, from New Holland and Van Diemen's Land. Fronds glabrous, ovate-lanceolate, somewhat drooping, sub-tripinnate, two to three feet long, deep green; pinnæ lanceolate; pinnules oblong-acuminate, segments rather ovate, largest next the rachis, and dentate at the margin. Stipes scaly; terminal, adherent to a thick creeping rhizome. Sori short, oblong, crowded, often two on one vein opening from each other; indusium vaulted and revolute.

57. A. axillare, J. Smith (Allantodia axillaris, Kaulfuss; Aspidium axillare, Swartz).—An ornamental evergreen warm greenhouse Fern, from Madeira. Fronds glabrous, sub-deltoid, ovate-lanceolate, drooping, from two to three feet long, tripinnatifid, lively green; pinnæ lanceolate; pinnules distant, drooping, narrow, oblong-acuminate, falcate; segments oblong-ovate, largest on the upper side next the rachis; margin dentate. Stipes scaly at the base; terminal, adherent to a thick creeping rhizome. Sori oblong, occasionally two on a vein; indusium vaulted and revolute.

58. A. umbrosum, J. Smith (Allantodia umbrosa, R. Brown). — An ornamental evergreen warm greenhouse species, from Madeira. Fronds glabrous, rather ovate, three to four feet long, tripinnate, light green; pinnæ lanceolate, lower ones standing forward; pinnules flat, lanceolate; segments oblong-linear, rounded at the apex, lower ones distant and pinnatifid, margin crenate-dentate. Stipes with a few dark scales at the base; terminal, adherent to a thick short horizontal rhizome.

METERACH, Willdenow.—Name corrupted from cheterak, applied to this plant by the Persian physicians.

Sori oblong or linear, unilateral on the sides of free or anatomosing venules, protruding through dense elongated scales. Indusium none. Veins forked or pinnate; venules free, or anastomosing, the lower exterior one soriferous on the side facing the rachis. Fronds linear, sinuous, pinnatifid or pinnate, from four to eight inches long, densely covered beneath with elongated fimbriate scales. -The station of these Ferns in regard to classification, and the existence or absence of indusia are points which have elicited much controversy. They were formerly classed in Grammitis or Gymnogramma, from being destitute of an indusium; but the unilateral oblique sori clearly indicate that the affinity lies more with Asplenieæ than with any other tribe. The genus comprises a few very elegant dwarf species, natives of Europe and the Cape of Good Hope; but only one of them is at present in cultivation, and that is an indigenous species. In consequence of the frond being densely covered beneath with elongated scales, their true character is not easily determined. Some assert that an indusium is present in an early stage, but obliterated by the scales; others imagine there is a slight trace of it in a thickening of the veins; but an examination of the fronds in all stages from infancy to maturity, has failed to show us any indusium, even though prosecuted by the tedious process of removing scale by scale under a microscope; hence we consider it as absolutely destitute of an indusium as any true Polypodium. Nor is this all the difficulty attending the proper classification and definition of these few species, for the venation in the European species is anastomosing, whereas in two others found on the Table Mountain at the Cape of Good Hope, the venation is forked and free! Fig. 49 represents a frond of C. officinarum, (med. size, a portion magnified, showing the position of the sori and venation)

1. C. officinarum, Willdenow (Grammitis Ceterach, Swartz) .- A dwarf hardy evergreen species, indigenous to Britain, and generally distributed throughout the middle and southern countries of Europe, Madeira, and North Africa. Fronds lanceolate, simple, sinuate-pinnatifid, from four to eight inches long; segments oblong-obtuse; upper surface glabrous, bright green, the lower surface densely covered with fimbriated chaffy seales.

EOTTOPTERIS, J. Smith.—Name derived from neottia, a bird's nest, and pteris, a fern; in allusion to the

birds build their nests.

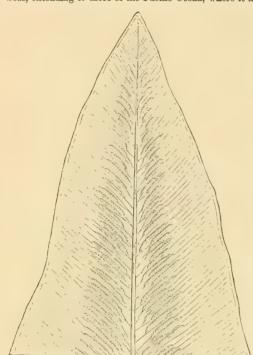
somewhat tufted rhizome.



Fig. 49. Fronds terminal, adherent to a

Sori linear, parallel, unilateral, on the superior sides of the venules. Indusium plain, of the same form as the Veins forked; venules direct, parallel, combined at their apices by a transverse continuous marginal vein. Fronds simple, linear-lanceolate, from two to four feet long, and from four to eight inches broad, coriaceous, glabrous.—Only a solitary species belonging to this genus is at present in cultivation, and but four are described as belonging to it. The technical distinction which separates them from Asplenium is the presence of a continuous marginal vein connecting all the oblique venules by their apices. Fig. 50 represents the apex of a frond

of N. vulgaris (med. size). 1. N. vulgaris, J. Smith (Asplenium Nidus, Linnaus) .-- A very handsome evergreen stove Fern, a native of New Holland, and according to Hooker (Bot. Mag. t. 3101), "the Peninsula of India, and Islands of the Indian Seas, extending to those of the Pacific Ocean, where it has been found in the Ladrone Islands, and to Oahu in the



Sandwich group, likewise in the Mauritius." Fronds glabrous, simple, rigid, elongate-lanceolate, acute, three to four feet long, coriaceous, shining, bright green, with an entire margin. Rachis ebeneous, angular beneath; stipes about an inch long, scaly; terminal, adherent to an erect rhizome. Sori linear, close, occupying the upper half of the frond, and half-way between the midrib and margin.

M NTIGRAMMA, Prest.—Name derived from anti, in the original species being ranged in opposite lines.

Sori linear, unilateral, usually in pairs on the proximate sides of the primary venules, at first distinct, but subsequently becoming confluent. Indusium linear, the free margins of each pair conniving. Veins forked; venules angularly anastomosing, or reticulated, with the marginal veinlets free. Fronds simple, lanceolate, cordate, entire or sinuose.--Half a dozen species are described as belonging to this genus, but only one of them is at present in cultivation. They have some affinity with Scolopendrium by having twin sori facing

each other, those of Scolopendrium being always directly opposite, whereas in Antigramma they are opposite or alternate, sometimes simple, and diverging from each other. They are easily distinguished from the Scolopendriums by

their anastomosing or reticulated venation. Fig. 51 represents a frond of A. rhizophylla

1. A. rhizophylla, J. Smith (Asplenium, Linnaus; Camptosorus, Link.)—A dwarf evergreen frame or greenhouse species, from North America. Fronds glabrous, simple, cordate-elongate, eight or ten inches long, bright green; upper part slender, filiform, acuminate, and rooting at the apex; terminal, adherent to a somewhat tufted rhizome.

MALLIPTERIS, Bory (Asplenium, sp., and Diplazium sp., of Authors; Anisogonium and Digrammaria, Prest.)—Name derived from kalos, beautiful, and pteris, a fern; alluding to the appearance of the fronds when in fructification.

Sori linear, binate, produced on both sides of the venules. Indusium plane, of the same form as the sori. Veins pinnate, each opposite pair of venules angularly anastomosing, the superior ones usually free. Fronds pinnate, bipinnatifid, or tripinnatifid, from two to six feet long, pubescent or glabrous, often viviparous. Stipes and rachis aculeate in some of the species.—The fundamental characters on which the genera of Ferns are constituted, run sometimes in two cases so nearly alike, that it is only at certain periods of growth or by a particular position of the venules, that the genus can be certainly recognised. This is clearly exhibited in Callipteris, which comes so near Diplazium that the only technical distinction which can be pointed out, is the anastomosing of the venules; the spore-cases in both being chiefly bilateral, with the lower sori binate and the upper simple. In cases where the fronds of Callipteris have few or none of the venules anastomosing, they are not really distinct from Diplazium, for Callipteris is known by its

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anastomozing venules, and Diplazium by having them free. Fig. 52 represents a small portion near the apex of a frond of C. malabarica (full size).

1. C. malabarica, J. Smith (Diplazium malabaricum, Sprengel; D. seramporense, Sprengel; D. pubescens, Link; Asplenium ambiguum, Swartz; Anisogonium seramporense, Presl; Digrammaria ambigua, Presl,—An evergreen stoye species, a native of various parts of the East Indies. Fronds pubescent, from four to six feet long, bipinnate, dull green; pinnæ lanceolate; pinnules rather membranous, oblong-lanceolate, inferior ones petiolulate, subcordate-auriculate, superior adnate-truncate, serrate at the margin. Rachis and stipes deeply furrowed, with a few scales toward the base. Fronds attaining the height of a foot or more; terminal, adherent to an erect rhizome.



2. C. esculentum, J. Smith.—An ornamental evergreen robust-growing stove species, from Ceylon. Fronds glabrous, bipinnate, three to four feet long, deep green; pinnæ lanccolate; pinnules oblong-linear-acuminate, inferior ones petiolulate, slightly cordate, sub-auriculate, superior adnate, crenate serrate at the margin. Rachis and stipes aculeate, with scales at the base; terminal, adherent to a thick creeping rhizome. This species was introduced in 1845.

# Carden Lints for Amateurs.

MONG the faults which amateur gardeners fall into in the management of their plants, especially AX through the winter, is that of crowding them too much together by housing more plants than they have room for, and thus very frequently spoiling nearly the whole. We know it requires a strong resolution to throw a quantity of nice looking and healthy plants away in the autumn, but it is better to do so at that time than to keep them to spoil the whole by the spring-for plants that are drawn and sticky are nearly worthless, and, even for flower garden purposes, they are not so useful as neat dwarf and bushy plants. We are quite persuaded this is one of the greatest errors that can be committed, as, either for house decoration or for planting out in the garden, one good plant is worth three drawn and indifferent ones. It is, therefore, indispensable, in housing the plants, to select such only as are really worth the space they will occupy, and to reject all others, throwing them to the rubbish heap at once. Thus, if your house is only sufficiently spacious to bloom say fifty small specimen Pelargoniums or Heaths, select those at once and give them their allotted space upon the stage, and fill in between them plants of less value, but remove those plants directly they are in the way of the larger and permanent specimens. This is the secret of producing the nice bushy plants so much admired by all at the London Exhibitions. They, even when full grown, rarely stand sufficiently near together to touch, and, as for allowing any other plant to touch them, it is quite out of the question. A friend of ours who grows a few Pelargoniums for exhibition thus manages them:-He puts no more into the house in the autumn than he intends to bloom there, and consequently, as they are small at that time, there is considerable space between the plants. In this space at the first outset, some neat dwarf plants (procured by layering,) of the finer kinds of Chrysanthemums, are placed, with, for contrast, a few plants of Salvias, Heaths, or other autumn blooming things. These, as they get shabby, are removed and replaced by Primulas, Cinerarias, and forced flowers, as Tulips, Hyacinths, Narcissus, &c., with small Azaleas, Tree Violets, Mignonette, Rhododendrons, Roses, and similar plants. In this way a constant succession of bloom is kept up; the house is always gay, and yet not one of the plants is ever permitted to interfere with the Pelargoniums. The same arrangement might be observed in every house, whether large or small, and the interest to be derived from it would be of a much more elevating and pleasurable description than can emanate from a crowd of ill-grown things. We make these remarks at this time to encourage our amateur friends to act wisely, to cultivate no more plants than they have proper accommodation for, and to grow a few nice specimens rather than a quantity of ill-grown and unsightly things. Though house plants are mainly grown for their flowers, they, even without flowers, if properly managed, may be made to present a very sightly

and interesting appearance; indeed a person who grows plants purely from the love of them, will derive as much pleasure from their daily and healthy progress as from their inflorescence. A man who can only admire a plant when in full bloom has no love for them, his taste is low and vulgar, and does not emanate from a refined and cultivated understanding. Such persons are pleased by the tawdry only, and cannot appreciate the refined and elevating study of the entire plant. To watch a plant from its first formation in the seed vessel, through all its changes and vicissitudes, to its ultimate and complete formation as the monarch of a forest or the more humble occupant of a garden pot, is an occupation worthy of the highly educated, and such as the most humble cannot pursue without becoming wiser and better men. Therefore, what is worth doing at all in a garden is worth doing well, and we should advise our amateur readers never to stoop to mediocrity in anything.

Among the hard-wooded plants, some of the strongest growing Heaths, Chorozemas, Pimeleas, &c., may still require another shift, and, no doubt, to some of the old plants which are breaking strong, a shift will be indispensable. Some cultivators object to autumn shifting, but, if plants are properly managed afterwards, it matters but little at what time you shift them. Plants shifted at this time will require more care in watering through the winter than if the pots were full of roots, but an observant cultivator will not care for that if his plants are benefited at the same time. Lose no time in getting the Pelargoniums of both kinds shaken out and potted into smaller pots, and many of the young plants struck this season will be ready to pot singly. It will be necessary to protect and shade the plants in a frame until they draw fresh root, but, after that, they should be exposed to all the sun and air possible, merely protecting them from heavy rain. The "Fancy" kinds should never be exposed to drenching rains, as it is almost sure to kill them if continuous. Calceolarias should now be in a shaded place, where, if in good health, they will soon produce abundance of cuttings; guard against green fly and thrips by occasional fumigations. Cinerarias must be divided or potted singly, using a rich compost and keeping a sharp look-out for mildew, which will soon play havoc with them. Seeds of all the foregoing plants should now be sown and got up in gentle heat. Chrysanthemums are looking very promising, and must have regular attention as to watering. Some of the strongest layers of the early blooming varieties will be fit to pot the end of the month, keeping them afterwards in a close but cold frame; but, if they can be protected in the open ground, it is scarcely worth while to pot them until the flowers are beginning to expand. Sow Phlox, Schizanthus retusus and retusus albus; Clintonia pulchella, and other half hardy annuals for blooming in pots in the spring.

Before taking the plants into the house for the winter, it is scarcely necessary to remark that every plant should be made perfectly clean, the walls being whitewashed, the flues or hot water pipes cleaned and repaired, and the stages, paint, and glass, washed with soap and water, or painted if necessary. Cleanliness is the main hinge of success in plant management, and too much attention cannot be devoted to it.

Among florists' flowers Dahlias are now in gorgeous beauty, the mild dewy nights of autumn are highly conducive to their well-being, and to the development of fine flowers. Take care that they do not suffer for the want of water. Hollyhocks are now beginning to fail, so lose no time in taking the side branches for propagating. If you have a nice gentle heat, such as a half spent hot-bed, every bud will make a plant, even if you split some of the stronger stems into two pieces. This is a noble tribe of plants, and this season promises to add some fine varieties to our lists. Pinks, if the beds have been properly prepared, may be planted out, and some of the early piped and layered Carnations will now be fit to pot. Carnations and Picotees may still be layered, though the time is getting late. Those who have Carnation seed ripe, if they sow it immediately in gentle heat and nurse the plants in pots or boxes through the winter, and plant them out early in the spring, may bloom most of them next season, and thus save a year. Make beds of Heartsease, and do not forget to attend to the Tulip bed, &c., to get composts housed before the rainy season commences. Auriculas and Polyanthuses must be got into their winter quarters, and be properly attended to.

Bulbs, and other things for forcing, must not be forgotten; but cultivators commit no greater error than that of crying out for very early bulbs. They think to steal a march upon time by getting them potted early; but the truth is, the bulbs, to get them ready for the early market, are taken up before the proper time, and hence are insufficiently matured; but those bulbs which arrive after the middle of September are properly ripened, and if potted at once into good soil, are quite fit for blooming in December. Last year we potted some bulbs of Waterloo and Grand Vainquer, into rich compost, and though the bulbs were by no means fine, the flowers were the finest we ever saw—Vainquer ten inches long, and Waterloo with four spikes, the smallest of which was equal to the best generally seen. The following compost would be found very suitable:—Rich turfy loam three parts, leaf mould one part, and cow dung one part, rotten stable manure one part, and gritty road

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sand two parts. These should be mixed intimately together—if some months before they are used, all the better. After potting, place the pots in a warm shaded corner, and cover the bulbs several inches deep with cinder ashes, or old tan, so as to prevent the top being excited before the pots are full of roots. Pinks for forcing must be potted towards the end of the month.

In the flower garden proceed with propagating without loss of time, especially of the more tender plants, as such things as Calceolarias will strike later in the season. If you preserve any of the old plants it will scarcely be safe to leave them in the ground after the end of the month. Cuttings that are rooted may be potted immediately, so as to get them established early. A little good soil at this potting will not be wasted upon them, as they will make stronger plants in small pots than if larger ones are used with poor soil.

Harvesting fruit will be the chief employment in the fruit garden; and, in picking it, too much care cannot be observed. Gather each kind as it becomes ripe, and place it at once in the place appropriated to it. Some advocate sweating fruit in heaps, others not; for our parts, we say gather it carefully without bruising, placing it in single layers if you have room, but if not, it may lie two or three thick without injury. Avoid placing it upon straw, and guard, if you can do so, against changes of temperature in the room in which it is placed. Wall trees must be attended to; go over them once more, and fasten the shoots if necessary, and protect the fruit, if you are so fortunate as to have any, from the attacks of wasps, and other insects. This remark applies more especially to the keeping Plums, as the Imperatrice, and Coe's Golden Drop, which, if protected from insects and damp, will keep good, and indeed improve in quality for several weeks to come. When quite shrivelled, the small branches may be cut from the tree, and if the plums are suspended in a dry room, they will keep until Christmas.

In the Kitchen Garden fill every vacant piece of ground with Coleworts for winter and spring use, and look well to carthing Celery in suitable weather. A little soot sprinkled along the rows at the time of earthing, will prevent the ravages of snails and worms, and if your ground is heavy, and you have it to spare, some fine cinder ashes around the plants will be a benefit. Earth the winter crops of Brocoli, Brussels Sprouts, &c., and prepare by well manuring and deeply trenching some ground for a good breadth of Spring Cabbage. Turnip seed of the early kinds may still be thrown in for the chance of a crop, and do not forget successional crops of Turnip Radishes, and small salading. Sow immediately in a warm corner, upon a sloping border, Early and Walcheren Cauliflower, and Lettuces of several sorts, more especially the Black Seeded Bath Cos, White Cos, Brown Dutch, and Hardy Hammersmith. Attend to the Winter Spinach by proper thinning, and give it a good soaking occasionally of liquid manure, or sprinkle it with soot in showery weather. Trench and ridge up all vacant ground.—P.

# New and Rare Plants.

Labichea diversifolia, Meisner. Various-leaved Labichea. (Paxt. Fl. Gard., ii., t. 52).—Fabacew § Cæsalpinieæ.—A curious and very pretty greenhouse shrub, growing to a moderate size, and having something the aspect, though none of the structure, of Heimia grandiflora. The leaves are sessile unequally digitate, the leaflets all linear-lanceolate, and spiny pointed, but the middle one many times larger than the lateral ones, which look like leafy stipules at its base. The flowers are about an inch in diameter, and grow in very short few-flowered racemes, much shorter than the leaves, the calyx and corolla each consisting of four parts, those of the former narrow acuminate, about as long as the petals, which are roundish oblong, deep yellow, one having a small blotch of red near its base; the flowers are not unlike those of a Cassia. From Swan River. Introduced in 1850. Flowers in April and May. Mr. Glendinning, of Chiswick.

Primula Sikkimensis, Hooker. Sikkim Primrose. (Bot. Mag., t. 4597).—Nat. Ord., Primulaceae § Primulide.—A very handsome stemless primrose, perhaps the tallest in cultivation, and the "pride of all the Alpine Primulas." The leaves are all radical, thin and submembranaecous, strongly reticulate-venose, eight inches to a foot long, the margin doubly and sharply toothed, obovate-oblong, tapering into a long broad red petiole, equaling the blade in length. The scape is from a foot to two feet in height, erect, and bearing an umbel of lemon-yellow flowers, much resembling those of the common primrose, and of about the same size; the limb of the corolla is sub-campanulate, the tube as long as the calyx. From Sikkim Himalaya, inhabiting wet boggy places, at elevations of from 12 to 17,000 feet. Introduced in 1850, by Dr. Hooker. Flowers in May. Royal Botanic Gardens, Kew.

Salvia Gesnere-Eflora, of gardens. Gesnera-flowered Sage. (Part. Fl. Gard., ii., t. 47).—Nat. Ord., Lamiaceæ § Monardeæ.—A magnificent greenhouse soft-wooded sub-shrub, growing from four to six feet high, and bearing throughout the winter months a profusion of large brilliant searlet flowers, which render it very ornamental. It has been compared with Salvia fulgens, which, however, it does not much resemble, except in

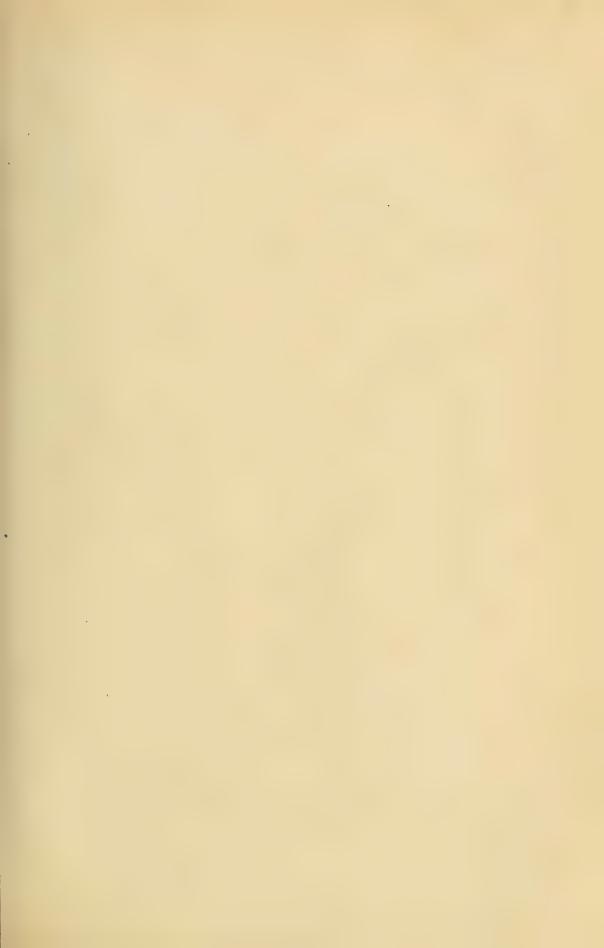
the general form and colour of its flowers, and in its habit of growth. It is a stouter plant than S. fulgens, having cordate ovate leaves with an acuminate point (a), more bullate than those of S. fulgens, the latter being also much narrower, elongate-ovate, but slightly cordate at the base, and not at all acuminate (b). The flowers grow in whorled simple panicles at the ends of all the branches, and are of a brilliant light scarlet, larger than



in S. fulgens, but nearly of the same form; the upper lip, however, of the corolla flatter, and less shaggy, the tube longer, and the style less feathery. From Central America. Introduced about 1847. Flowers through the autumn and winter. Introduced by Mr. Purdie, and first flowered at Syon.

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### SARCOPODIUM LOBBII: VAR. HENSHALLII.

Nat. Order .- ORCHIDACE.E.

Generic Character.—Sarcopodium, Lindley.—Sepals unequal, the posterior linear lanceolate, acute, ventricose at the base; the lateral broader, obliquely dilated, and ventricose at the base, leathery, adherent to the column. Petals somewhat like the posterior sepal, adherent to the back of the column. Labellum articulated to the column, cordate, acuminate, reflexed, leathery. Column short, obtuse, without processes. Pollen-masses four.—Pseudo-bulbous herbs, with the habit of Bolbophyllum. Pseudo-bulbs one-leaved, springing from a scaly creeping stem; scapes arising singly from the base of the pseudo-bulbs, sheathed at the base with imbricated scales. Flowers solitary, large, leathery.

Sarcopolium Lobbit, Lindley.—Leaves petiolate, oboratoolong, coriaceous; peduncle naked, one-flowered, shorter than the leaf, somewhat glandulose at the base, breaking out from scaly, hooded, sickle-shaped, rather glandular bracts; sepals oblong, acute, the lateral sickle-shaped; the petals like the sepals, but smaller, reflexed, the labellum with long claw, cordate-ovate, acute, channelled, recurved at the apex.

SYN.—Sarcopodium Lobbii, Lindley, in Flower Garden, i. No. 199, fig. 93.—Bolbophyllum Lobbii, Lindley in Bot. Reg.—Bot. Mag., t. 4532.

 $Var.\ Henshallii.$ —Henshall's Sarcopodium.—Flowers much smaller, and of paler colour.

ESCRIPTION.—A stove epiphyte, with ovate smooth green pseudo-bulbs, springing from a creeping scaly stem. Leaf solitary at the apex of the pseudo-bulb, oblong-lanceolate, leathery. Scapes simple, one-flowered, arising from the side of the base of the pseudo-bulb; shorter than the leaf, and having small convex siekle-shaped bracts imbricated over its base. Flowers solitary, spreading, about three inches across. Sepals leathery, lanceolate, acuminated, the lateral obliquely dilated, and all ventricose at the base. The petals somewhat like the posterior sepal, but sickle-shaped and converging forwards, adherent to the back of the column. Labellum articulated to the column, cordate acuminate, reflexed, leathery, dilated at the base. All parts of the flower yellowish buff, the posterior and lateral sepals, streaked with small light purple patches on the under side, the upper faces, and those of the sepals, faintly streaked with brownish purple.—A. H.

HISTORY.—This plant seems scarcely to differ from S. Lobbii, except in the smaller size of the flowers and their paler colour; and we have therefore referred it to that species. It was imported by Messrs. Rollisson of Tooting from Java, through their collector, Mr. John Henshall; and our drawing was prepared from a plant exhibited by them last May at the fete of the Royal Botanic Society in the Regent's Park. It first blossomed in the spring of 1849.

CULTURE.—The Sarcopodiums are closely related to the Bolbophyllums, and require very similar treatment. Thus they may either be grown on blocks of wood, with a little sphagnum over the roots, and the blocks suspended from the roof of the orchid-house; or they may be potted on an elevated mass of very light fibrous peat soil. In either case, the present subject requires to be kept in the warm division of the house. Beyond this, it requires the usual treatment of this race of plants; and, in particular, to be guarded against excess of moisture in the winter season, and when at rest.—\*

### A FEW WORDS ON THE "CRYSTAL PALACE."

"To be or not to be, that is the question."

MONG the things for which this country holds a rather unenviable notoricty, its public buildings are not the least remarkable, for, from Buckingham Palace and the Houses of Parliament, down to the most recent, though perhaps the most remarkable, innovation of modern times—the Palace of Glass, it may safely be asserted there is not a public building which is not ruined by the situation in which it is placed. Yet at the same time we arrogate to ourselves great taste, and would have the world believe us matchless in such matters. But what are the facts? The Houses of Parliament by a stinking and nearly stagnant ditch. Buckingham Palace searcely above the level of the water in its neighbourhood. Yet within a short distance of their present defective sites, there are situations as fine as could possibly be desired: for instance, the Houses of Parliament in Hyde Park, Buckingham Palace on Hampstead Heath, and the Crystal Palace in Kensington Gardens. For purposes of convenience no site could have been more suitable than that on which the Crystal Palace now stands; but for a permanent building there are many and serious objections to it, and for that reason, if it is to be retained as a monument of the grand idea on which it originated, and as an emblem of good-will to all mankind, we say down with it, and rebuild it in a place where, while it will be suitable, it shall show the world that we retain it as the first link in the chain of civilisation, and as the battle-ground upon which the nations of the earth first met in friendly rivalry—where art, science, intellect,

and ingenuity were the arms used, and where (we hope we may say in sober truth) they learned to cultivate the art of peace and to "war no more."

But it may be asked—What objections are there to its remaining in its present place? First, then, we would say the inappropriateness of the site, inasmuch as it is too near the main road to be properly seen; secondly, it will at times be smothered in dust from carriages passing so near it; and thirdly, because as it at present stands it looks like a huge hand-glass with a wooden bottom placed upon an insecure foundation. Instead of as it stands at the present time, fancy it placed upon a raised platform some one hundred and fifty or two hundred yards longer and broader than the base of the building—fancy in addition that it had a substantial stone foundation, and that on the outside on the platform or terrace it was supported by colossal fountains, vases, and other architectural and gardenesque enrichments, and we should have a building worthy of the country and of the occasion which originated it. Place it in a situation which, while it will be of ready access, shall at the same time be removed from the busy hum of men, and be quiet and gardenlike. Such a situation is to be found in Kensington Gardens, between the end of the Serpentine and the basin opposite the Palace, the centre of the building coming near where the walks converge in the centre of the garden. This is the most appropriate situation we know of.

Whether the building is retained where it now stands, or be removed, one thing is quite certain, the whole of the roof must be re-glazed, and, we suspect, the woodwork must be refitted; for, erected when it was, and in the hurried manner—from the unseasoned state in which much of the timber was used—the inexperience of many of the workmen employed, and the carelessness of others—the state of the weather, and the impossibility of making good work at that season—it cannot be doubted that the woodwork is of a very faulty description, and such as neither Mr. Paxton nor the contractors could pronounce first-rate. Every person who has had anything to do with wood, paint, and putty in the open air, in the winter season, is aware of the impossibility of making good work at such a time, and every builder knows, or ought to know, that in glazing, if a square of glass gets a shake, between the time of its being bedded in and the putty becoming firmly set, it is almost impossible to make it waterproof afterwards.

Presuming, however, that it must stand, or be removed to a more suitable site, and not doubting but that plants suitable to grow in it are common enough, in what manner ought it to be laid out? "Denarius" and Mr Paxton, in their pamphlets, both advocate equestrian exercises; but against such a desecration of a noble building we must at once protest. Gentlemen at their country seats do not think of riding in their gardens or pleasure-grounds; they are content with the park or the farm. No person thinks of riding in the gardens at Kew or Hampton Court, the Horticultural Gardens, Chiswick, or the Royal Botanic Garden, Regent's Park; they are content to ride to the gates,—and we should hope no horse will ever be permitted to go within the walls of the Crystal Palace. Let those persons who are too lazy to walk, ride round the outside. To the admission of invalids with garden chairs we have not the least objection, but the idea of horses prancing about, disfiguring the walks, and occasionally cutting their capers among the plants, is simply too ridiculous to bear a second thought. If the admission of equestrians would realize ten times the amount calculated upon by "Denarius," we would exclude them; but, in a financial view, the matter is soon met—for we have only to do what we ought to do, viz., throw the garden open on Sunday, and all that could be expected from equestrians would be realized. But how is it to be laid out? Why, as it originated in circumstances with which all the nations of the earth were concerned, could we pay a more graceful tribute to those who have aided in the great work than to lay the garden out geographically, so that each country should be represented, not only as to its natural position, but also by its native vegetation? Oh, but remarks some pseudobotanist, if you have the plants of tropical countries, they must, to grow them successfully, have a tropical climate, and then the objections of the Quarterly Review come into full force. But tropical countries have mountains as well as valleys, some of them rising to the line of perpetual snow, and it is from these that we would select vegetation to represent them.

From almost every country we have plants sufficiently hardy for a greenhouse temperature, and from some tropical countries plants that are quite hardy. India could not be more splendidly represented than by the Sikkim Rhododendrons lately introduced by Dr. Joseph Hooker; China by the splendid evergreen trees now in the possession of Messrs. Standish and Noble; indeed it is quite certain that with a greenhouse temperature all that a geographical arrangement would require could be accomplished. When we speak of a geographical arrangement we do not mean that the form of the countries should be attempted, all we wish is, that India, China, Africa, America, Russia, France, Austria, and other countries that have contributed, should be represented in the arrangement, and by the plants which they respectively and naturally produce. To this we think there cannot be the

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slightest objection, for whether the space be laid out geometrically, which its form would suggest, or naturally, it is quite certain that it may be so divided as to attain all that has been hinted at in the preceding remarks, and whether the various countries be represented by squares, circles, parallelograms, or any other forms which the taste of the designer may suggest, matters little.

Under such a distribution some parts of the building would not require to be heated at all, but still the plants would not be injured by a slight heat, and they would soon accommodate themselves to the circumstances under which they would be placed. We should like, however, to see the Transept planted with those things for which it is alone adapted, viz., Palms, Bananas, and Tree Ferns, and we see no reason why Messrs. Loddiges' collection of these noble plants should not be transferred there at once, or at least as soon as the house is ready for its reception. We would then make that part into a tropical stove, but we would have glazed passages through it, by which those afraid of the heat might pass from one end to the other of the building without being exposed to the only peg (heat) which even the fertile imagination of the writer in the Quarterly can hang an objection upon. part furnished with the graceful foliage of Musas and Palms, the elegant fronds of Tree Ferns, with some of the more remarkable forms of Orchids, and other tropical plants, would have a truly grand effect; and to such an arrangement, we imagine, no material objection could be offered; for those who are afraid of the temperature need not go into it, and those who are not afraid would have a luxurious treat. To a geographical arrangement of the building some objections may be urged, but Mr. Ward, in his little book upon his system of growing plants in close cases, urges the same arrangement for plants in small houses; and it is but justice to remark, that the idea of a "Sanitarium" was promulgated by the same gentleman long before the Crystal Palace was thought of. How far the taking out of the glass during the summer months, as proposed by Mr. Paxton, will agree with the generally received notions of a "Sanitarium" it is not our purpose to enquire; this, however, is quite certain, it will allow the plants to be coated with dust, and hence will furnish plenty of work for the men employed. This we regard as an impracticable part of the scheme.

Much of the expense of keeping will depend upon the style in which the garden is first planted: if it is well done, the after-expense will be comparatively trifling; but if it is to be planted piece-meal, why then a large annual expenditure will be indispensable. Should the building be retained, we have no doubt there are hundreds of gentlemen in the country who would contribute their surplus plants; and from Kew alone, plants sufficient to plant half the building might be had, with advantage to both establishments; for at the present time, at Kew, they merely drag out a miserable existence, while in the Crystal Palace they would have ample room to develope their natural peculiarities and beauties. By some, no doubt, it will be urged that the finer kinds of plants will not succeed so near London; but we have seen plants splendidly grown within a stone's throw of the present building, and have no doubt that with good gardening, and great cleanliness, a vast collection of plants may be grown with complete success. Of the sanitary and humanizing influence of such a retreat for the inhabitants of the great metropolis we need not say a word, and how much information both young and old may gather, by the study of the varied occupants of the palace, it is not necessary to specify.

Since the above was in type (a pressure of matter having prevented its earlier publication) we have seen, in the Phytologist, Mr. Newman's proposal for a great City conservatory, or glazed Garden, on the site of Smithfield Market; which is, certainly, a bolder scheme than that of wishing to retain the Crystal Palace as a winter garden. Much, however, as we should approve of any scheme that would get rid of Smithfield and its demoralizing influences, we must confess we cannot go the length of wishing to see beautiful plants pent up in such a locality; for, while we grant that many things would grow there or anywhere else, in close cases, we do not see how they can succeed, at least we are sure they cannot succeed in a situation where, for the regulation of the temperature, if for nothing else, air must be admitted, and such air as would in a short time ruin any plant in the world; even Ferns and Cryptogams would rebel against it. Mr. Ward, no doubt, may grow plants "in a closed case in the worst possible locality," but that is a very different thing to growing them in a glazed garden, open to the public, and which must of necessity be ventilated almost daily. We say nothing of the soot and smoke-begrimed appearance of a glass house in the very centre of the metropolis, for, though the scheme is well reasoned, we simply regard it as impracticable, and as such not likely to be carried out. We are quite willing to believe that many plants-stove plants more especially, may be grown with a less admission of fresh air than is generally considered necessary, but still the temperature must be kept down, and consequently air must be admitted. If the temperature could be kept sufficiently low we could willingly dispense with so much ventilation; but, without that, air must be given. We therefore consider Mr. Paxton's scheme the most practicable, and though we should like to see the Palace removed, we would rather see it where it now stands, than witness plants dragging out a miserable existence in Smithfield.

Mr. Newman's plan seems well devised, and if the inhabitants of the metropolis are to have a glazed garden, some such plan might be adopted. It is, in brief, this:-The area should be divided into six principal compartments, representing Europe, Asia, Africa, North America, South America, and New Holland. In each division should be placed the vegetable productions which are natives of the soil,—in all instances imitating as nearly as possible the natural conditions of the plants themselves. Each geographical district should be further illustrated by stuffed specimens of the quadrupeds, birds, and reptiles for which it is most remarkable. In the centre of each compartment should be a model of the continent whose productions it exhibited, its ascertained mountains, its rivers, seas, &c., displayed in their exact proportionate height, situation, course, length, &c.; and the unknown parts, as the interior of Africa, Australia, China, &c., left blank. At each model a demonstrator should be stationed, thoroughly qualified to give explanations, and he should hourly give such explanations unasked, in the most simple, intelligible, and unassuming manner, carefully pointing with a light wand to the part to which he was alluding. In connecting the continents, which are naturally connected only by water, the mode of transmission should represent a ship's deck, and those which join should be united by dry land. Each continent should be further illustrated by some of its aboriginal inhabitants, in the ordinary dress of their respective countries."-A.

### THE NATIONAL FLORICULTURAL SOCIETY.

July 31.—At this meeting the most interesting part of the exhibition was a collection of seedling Roses from Messrs. Paul of Cheshunt. Of these a hybrid perpetual, called Queen Victoria, was the best, and received a first-class certificate; in colour it bears some resemblance to Bourbon Queen, and is a fine variety. A similar award was made to a climbing perpetual, of the colour of Chenedolé, and said to be a very profuse flowerer; it was named Robert Burns. The other kinds consisted of Bourbon, Prince Albert, with good colour; and Washington Irving, a neat, rosy-lilac hybrid perpetual.

Several Picotees were produced. Mr. Turner received a certificate for Victoria Regina, a heavy-edged rose, and for Duke of Rutland, a heavy purple-edged variety. A rose flake Carnation, from Messrs. Wood and Ingram, called Lady Pollock, the censors wished to see again, and also Mr. Fellows' Picotee 51. Mr. Turner's Carnation General Monk, and Picotee Ophelia, were commended. Fuchsia Nonesuch from the same grower received a certificate for its fine habit. A bright crimson mule Pink, from Mr. Payne, was commended for its colour. Eliza Cook Verbena, rosy purple with white eye, from Mr. Smith, was commended. Hollyhocks were contributed by Mr. Chater and Mr. Laing, but not being shown in spikes they could not be noticed.

August 7.—A variegated Pelargonium, called Mountain of Light, was produced from Messrs. Lee of Hammersmith, to which a first-class certificate was awarded. It is a plant of considerable promise, the truss being good, the flowers bright searlet, and the foliage beautifully marked; the habit is dwarf and compact. A Picotee, called Christabel, from Mr. Costar, received a certificate, and Mr. Holland had a very promising heavy purple variety, named Countess of Wilton. Collections of Picotees, Carnations, and Dahlias, were sent by Mr. Edwards. Phlox Mayii striata, was again sent by Messrs. Henderson, who also had a tall purple Lobelia, called Aurora, and Gloxinia tricolor. Mr. Bragg sent Hollyhocks in spikes, with Carnations. Picotees and Dahlias, and similar collections came from Mr. Turner, of the Royal Nursery, Slough. Mr. Laing sent a Hollyhock, called Purple Perfection, and Mr Barnes had a nice display of Marigolds.

### THE HORTICULTURAL SOCIETY.

August 5.—At this meeting there was a very good display both of plants and flowers. Mrs. Lawrence sent a collection of Orchids, among which was a new Cycnoches, bearing a pendent chain of flowers, fifteen inches long. Mr. Smith, gardener to W. Quilter, Esq., had six very beautiful Heaths; and Mr. A. G. Henderson Æchmea miniata and discolor, Pitcairnia suaveolens, and Tillandsia carnea, all interesting plants. Mr. Rivers sent Cherries, Plums, Peaches, and Pears, in pots, bearing ripe fruit. They had been grown in Mr. Rivers's orchard-house, a contrivance which, at a small expense, places us, in our fickle climate, beyond the injury of spring frosts. Fine Pines were contributed by Mr. Markham, gardener to the Hon. R. Clive, M.P. Mr. Price, gardener to W. Thompson, Esq., and Mr. Jones, gardener to Sir John Guest, sent two Queens, one 6 lbs., and the other 5 lbs. 12 oz., and an Enville, 7 lbs. 11 oz. Grapes were sent by Mr. Markham, and Mr. Martin, gardener to Sir H. Fleetwood. Mr. Markham had a Cabul Melon, weighing 13 lbs. 15 oz. Mr. Martin had some Morello Cherries. Mr. Cuthill sent Black Prince Strawberry, to show that it is a late as well as an early bearer. Some Plants, a Golden Perfection Melon, and a collection of Lettuces, Gourds, Turnip-Rooted Cabbages, and Sugar Peas, were sent from the garden of the Society.

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### SIPHOCAMPYLUS AMŒNUS.

Nat. Order .- LOBELIACEE.

GENERIC CHARACTER.-Siphocampylus, Pohl.-Calyx with an obconical, turbinate, or hemispherical tube, adherent to the ovary, limb superior, five-toothed. Corolla inserted at the summit of the tube of the calyx, tubular, the tube entire, incurved or more rarely straight; limb five-toothed, two-lipped, the segments nearly equal, or the upper two rather longer. Stamens five, inserted with the corolla; filaments and anthers connate, the lower two or all the anthers bearded or mucronate at the tip. Ovary inferior, the apex slightly exserted, twocelled; ovules numerous, anatropous, on fleshy placentas adhering longitudinally to each side of the dissepiment; style included; stigma exserted, two-lobed, lobes divergent, orbiculate. Capsule two-celled, longitudinally two-valved at the exserted apex. Seeds numerous, small, pitted; embryo orthotropous in the axis of fleshy albumen, radicle next the hilum, centripetal. -Under-shrubs of tropical America; leaves alternate or opposite, stalked, serrate; flowers axillary, solitary, stalked, rarely

crowded into a raceme or corymb, red.—(Endlicher Gen. Plant., 3059.)

SIPHOCAMPYLUS AMENUS, Planchon.—Charming Siphocampylus.—Stem branched, sub-herbaceous, and, like the erect angular branches, clothed with powdery pubescence; leaves alternate, oblong-lanceolate, acuminate, acute, narrowed into a short petiole, margins with divergent glandular teeth, the upper face with a silvery lustre, the lower with sparing short pubescence; the upper leaves passing gradually into narrow lanceolate bracts; racemes terminal, many-flowered, pedicles longer than the calyx; calyx with a patelliform tube rather flattened at the base, teeth half lanceolate, adpressed to the corolla, glandular-dentate; corolla small, rather straight, lobes narrow, the upper ascending and divergent only at the tips; anthers included, bearded at the top, otherwise glabrous.

Syn.—Siphocampylus amœnus,  $\overrightarrow{Planchon}$  in  $\overleftarrow{Flore}$  des Serres, vi., t. 619.

ESCRIPTION.—A half shrubby branching plant with the somewhat herbaceous stem, and erect angular branches clothed with very minute dust-like pubescence. The leaves, which are alternate, are oblong-lanceolate,  $1\frac{1}{3}$  to 2 inches long, acuminate, acute, narrowed into a short stalk at the base, the margin serrulate with fine spreading glandular teeth, slightly undulated, the upper side exhibiting a silvery lustre from the presence of a minutely papillose epidermis (not hairy) of an agreeable green, the lower face with a very short scattered pubescence. The upper leaves change gradually into narrow lanceolate bracts. The inflorescence consists of terminal many-flowered racemes, the pedicels being longer than the calyx. The calyx has a patelliform tube with a flattish base, and semi-lanceolate purplish teeth, appressed to the corolla and glandularly toothed. Corolla small, rather straight, of a charming orange-red, the lobes narrow, acute, the upper only ascending and diverging at the tips; anthers included in the tube, bearded with hairs at the tips, the rest glabrous; the filaments very glabrous all but their base.—A. H.

History, &c.—This charming species appears to have been introduced to the gardens of the King of the Belgians at Laeken, about two years since; and is said to have been obtained from the soil which was imported with a collection of Brazilian Orchids, sent by M. Ghiesbreght. It is probably from some part of Central America rather than from Brazil. From Belgium it has reached this country through the establishment of M. Van Houtte, of Ghent. We are indebted to Messrs. Knight and Perry of the Exotic Nursery, Chelsea, for the opportunity of making the drawing from which the annexed figure has been prepared. It first bloomed with them in November 1850, when our drawing was made; and subsequently in the course of the past summer, so that it may be considered a free-blooming species, as it is also a rich-coloured and very ornamental one.

It would appear to be a more vigorous growing plant than our plate represents, from the figure published in M. Van Houtte's *Flore des Serres*, where the racemes of flowers are shown to be several inches in length.

Culture.—This plant, which is of herbaceous or sub-shrubby habit, may be propagated by cuttings of the young shoots, planted in very light soil, and kept in a gentle moist heat. Established plants succeed best in a compost of light sandy loam, mixed with about a fourth part of peat soil. The soil must be kept free and open by the use of a perfect system of drainage, so that the roots are not subjected to injury from the presence of stagnant water, which they do not like, although, when in free growth, they require to be liberally supplied with fresh water. We understand it succeeds best in the intermediate heat of a cool stove; though young plants raised from cuttings in a hotbed, would require to be nursed on in a somewhat warmer atmosphere until they have acquired some degree of strength.—M.

vor. ur.

### ROSE INSECTS.\*

By J. O. WESTWOOD, Esq., F.L.S., &c., President of the Entomological Society.

THE YELLOW-TAIL MOTH.

MELIGETHES ÆNEUS.

Euproctis auriflua, Hübner, Verzeichniss, p. 159. Syn. Bombyx auriflua, Fabricius, Ent. syst. iii., pt. 1, p. 458, but not of Stephens, Wood, Westwood and Humphreys.

Porthesia Chrysorrhæa, Stephens, Illustr; Westwood and Humphreys' British Moths, i., pl. 18, fig. 7, 8, but not of Linneus and Hübner. (Male) Bombyx Aurifluss. Haworth. (Female) Bombyx Chrysorrhæus. Haworth.

### BALANINUS BRASSICÆ.

Fig. l, natural size.

Syn. Rhynchenus Brassice, Fabricius; Stephens, Man. Brit. Coleopt., p. 232. Curculio arcuatus, Marsham. Balaninus Salicivorus, Paykull; Stephens, Illustr. Mand., iv., p. 71.

Syn. Nitidula Enea, Fabricius, Syst. Eleuth. i., p. 353; Panzer, Ins. Germ., pt. 83, fig. 6. Meligethes urticæ, Stephens, Illustr. Mand., iii., p. 47.

LYDA INANITA.

Syn. Tenthredo inanita, Villers; St. Fargeau; Stephens, Illustr. Mand., viii., p. 180. (Lyda in.) Lyda inanis, Klug Blattwesp. 18.

THE LEAF-CUTTER BEE.

MAGACHILE CENTUNCULARIS Syn. APIS CENTUNCULARIS, Linnæus and Kirby, but not of Panzer, Donovan and Harris (which is MEGACHILE LIGHISECA).

MICROSETIA CENTIFOLIELLA.

Syn. Tinea Ruficapitella, Haworth, Lep. Brit., p. 586; Stephens, Illustr. Haust.

UR horticultural friends will, we fear, scarcely thank us for informing them that that queen of flowers, the Rose, is subject to the attacks of a greater number of insect enemies than almost any other plant or tree, if, perhaps, we except the Oak. It was, we believe, St. Pierre, who stated that after studying the economy of the different species of insects which frequented a Rose-tree in his garden for thirty years, he still found fresh subjects of enquiry; and, in confirmation of this assertion, we may observe that, in our own garden, at Hammersmith, we have discovered several species on the Rose whose habits are of the most interesting kind, and of which several are of great rarity in the collections of the professed entomological amateur. In our former article on the Rose-insects, (Vol. i., p. 195,) we have represented several species, varying in their modes of attack upon the plant, which may be thus classified:—

1. Those which feed upon the flowers when fully opened. Ex. The Rose Chaffer, which especially eats the pollen and nectaries.

2. Those which feed upon the buds. Ex. The Bergmannian Tortrix.

3. Those which feed upon the leaves, either,-

a, By fastening several of them together with thread: Ex. The Black-cloaked Tortrix; or, b, By feeding upon the leaves separately: Ex. The Caterpillar of the Anther Rose Sawfly.

4. Those which feed on the stem of the plant, to which they have given an unnatural development in the shape of galls. Ex. The two species of

Gallflies—Rhodites Rosæ, and Eylax Brandtii.

Pursuing the same system of classification, we propose in the present article, to illustrate the history of several species which attack the flowers and leaves of the Rose.

THE YELLOW-TAIL MOTH. — This conspicuous moth varies from one and a quarter to one and three



Fig. 1.

quarter inches in the expansion of its forewings, which, as well as the body and hind wings are of a pure white, the branches of the antennæ and extre-

mity of the body alone being of a yellow colour. The male differs in having the under side of the forewings brown, and with a small dusky spot near the posterior angle on the upper side, which is sometimes slightly indicated in the female, as may be seen in the accompanying figure. This sex is also distinguished

by having a large tuft of yellow woolly-like hairs at the extremity of the body, which serve as a \* Continued from Vol. I., p. 195.



coating for the eggs when they are deposited. The caterpillar is black, thickly clothed with long black hairs, those nearest to the legs being of a brownish colour, a double red line running along the top of the back, interrupted on the fourth or fifth segments, each of which is produced into a small tubercle or hunch; on the ninth and tenth segments the red lines form two wax-like spots. There is also a row of spots along each side of the body, formed of short tufts of white hairs, and below these is a red longitudinal stripe. The caterpillar feeds on various trees, as the Oak, Elm, Black-Thorn, &c., in June. During the present year, we have also observed it feeding upon the petals of the small Scotch Rose, in our own garden. It evidently preferred the petals, as it was only when not provided with a supply of the flowers that it also attacked the leaves. The moth appears at the end of July, and is a common and very widely distributed species. The caterpillar also feeds on the Pear, on which tree we have noticed it, for several successive seasons, in the gardens of the Horticultural Society at Chiswick. It is occasionally destroyed by one of the parasitic Muscidæ which we have reared from it. There has been much confusion in the nomenclature of this and the allied species, the Brown-tail Moth, the systematic names of the two species having been transposed, and the two sexes having been given as distinct by some authors. The recent investigations of Messrs. H. Doubleday and Stephens have cleared up the confusion, and we now give this species under its legitimate specific name.

Figure i in the preceding woodcut represents the full-grown caterpillar, and the female moth is given in the detached figure (Fig. 1).

BALANINUS BRASSICE.—This little weevil, although generally found upon willows and pot-herbs, as well as in hedges and gardens, is very fond of the petals of the Rose, upon which we have observed



it feeding, riddling them through with small holes. It belongs to the genus Balaninus (the type of which is the Nut weevil), but to a different section of the genus, having the extremity of the body nearly covered by the elytra. It measures from one-seventh to one-sixth of an inch in length, including the long slender snout, (at the extremity of which the minute jaws are fixed,) and is of a black colour, slightly

clothed on the upper side with fine ashy down, the scutellum being snow-white and the under side of the body and breast white; the rostrum, or probocis is very

long and slender, slightly furrowed longitudinally at the base; the antennæ are fixed at about one-third of the length from the tip, the basal joint is pitchy or dark red,

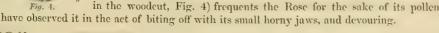
the remainder blackish, finely-hairy, the prothorax is thickly covered with small punctures, the elytra are rather deeply marked with rows of impressed dots, the interstices with a double row of minute ashy scales. The legs are black, the thighs clavate, each having a small acute spine beneath. Varieties occur with the antennæ either entirely black, or nearly, or entirely This is a common and widely dispersed species. It is represented highly magnified in the woodcut (Fig. 3).

MELIGETHES ÆNEUS.—The two prece-



ding species feed on the petals of the flowers of the Rose when fully The little expanded. insects now before us (Fig. 2, k, natural size, one represented flying; and highly magnified

Fig. 1. in the woodcut, Fig. 4) frequents the Rose for the sake of its pollen, which we





It measures a little more than one-twelfth of an inch in length, and has the upper surface of the body of a shining dark green colour, thickly covered with minute impressed dots, those on the elytra being rather larger than those of the head and thorax, the parts of the mouth are pitchy. The antennæ are black, the base slightly tinged with a pitchy hue, the prothorax and elytra have the lateral margins slightly recurved. The legs are short and broad, the fore legs reddish, with the tibiæ outwardly serrated, the four hind legs black. It is a very common species, and delights to fly in the hottest sunshine in the months of June and July amongst flowers.

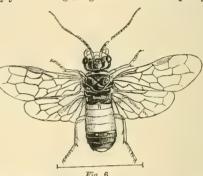
We now recur again to the species which feed upon the leaves of the Rose, the accompanying figure representing the different modes of attack adopted by three different kinds of insects: each of these, however, possesses something or other peculiar in its economy which removes it from the list of those species which simply feed upon the leaves of this plant. The figures 4, a, b, c, d, and e, illustrate the history of a species which, whilst it derives its nourishment from the leaves, makes use of portions of them for the construction of a house or moveable case, in which it resides during its caterpillar state. The figures g and g, illustrate the proceedings of a solitary species of bee, which, although it gnaws out large pieces from the leaves, does not do so for the purpose of obtaining nourishment therefrom, but simply in order to collect materials to line the interior of its nest, which it had already hollowed out in some adjoining wall or stump; and figure f, shows the mode in which the leaves are disfigured by the caterpillars of a small species of moth, which feed between the upper and lower surface of the leaf, eating only the parenchyme.

LYDA INANITA.—For many years past we have regularly observed this insect in our garden at Hammersmith, in the last week in May and the first in June. It is constantly seen flying over, or settling upon, the leaves of the Rose, and its extremely glossy yellow wings, together with the rapidity



Fig. 5.

of its movements render it quite a conspicuous object. Although, however, we have so repeatedly seen the insect, we have never yet been able to find a single male, all the individuals which we have observed and captured having been females. This



sex measures five-twelfths of an inch in length, and the expansion of its fore-wings measures seven-eighths of an inch. The head and eyes are black; the front of the face, a heart-shaped spot between the antennæ, and a curved spot behind each eye, pale yellow. The jaws, palpi, and antennæ are also pale yellow, the extremity of the jaws being black, and the tips of the antennæ rather brownish. The thorax is black above, with the collar pale yellow on each side. The abdomen is black, with the second, third, fourth, fifth, and terminal segments of a rich orange yellow. The legs are pale yellow, and the wings very glossy, and of a yellow tinge, with dark veins. Figure e represents the female of the natural size, and the woodcut (Fig. 6) shows it magnified.

The male, which is extremely rare (and for an opportunity of figuring which we are indebted to James Francis Stephens, Esq.,) is smaller than its partner, measuring only one-third of an inch in length, and five-eighths of an inch in the expansion of its wings, it differs also in being considerably darker in its colours; the antennæ being brown, except the two basal joints; the abdomen is black, the fourth and fifth segments being variegated with yellow, of which colour there are also spots at the sides of the preceding and following segments; the head is black beneath, with the sides pale yellow, the body (including the whole of the abdomen) is pale yellow beneath, with the hind part of the mesosternum, and the greater part of the metasternum, black. The wings have very little of the yellow tinge of the female. The woodcut (Fig. 5) shows the male magnified in the same proportion as the female. We believe that no figure has hitherto been published of the male.

At a later period of the year, namely, in the month of July and beginning of August, we met with a curious object on the same Rose trees which we are able at once to recognise as the larva of this Sawfly and its moveable case; Fig. 4, d, in the preceding cut, represents this larva with its head and the anterior segments of the body protruded out of the case, b, the wider part of which is formed of por-

ROSE INSECTS.

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tions of the leaf upon which the larva is feeding, and which it has not yet actually detached from the leaf; Fig. c indicates the narrower part of the case formed of portions of other leaves, fig. a showing the opposite leaflet almost entirely stripped to its mid-rib; one portion having been consumed, and another portion employed in the construction of the narrower part of the case.

The proceedings of this larva in the manufacture of its case are full of interest; it will be observed, for instance, that the instinct of the insect teaches it to arrange the narrow strips of the rose leaf, of which the case is formed, in a spiral direction, that being the only method in which greater length can be given to the case, in order to keep pace with the increased size of the insect; the spire is kept in its position by means of silken threads, which the larva weaves from its mouth, and by which it attaches the mouth of the case to the leaf when it has finally detached the strip. As the soft skin of the larva requires a covering for a defence, so the insect, on the slightest alarm, withdraws into the mouth of the case, otherwise when it desires to feed it protrudes the front of the body for about a quarter of an inch out of the mouth of the case, and then gnaws the rose leaf at its ease; the pair of legs at the end of its body enabling it to keep firm footing within. Now it will be seen that the length to which the body is protruded is just the width of the strip of the leaf of which the case is made, and so it is that, commencing at one end of a leaf, it cuts away the strip, fastening it by degrees with silken threads to its house. Huber has given a very full account of the proceedings of a species with precisely similar habits, found upon the nut, a translation of which appeared in the "Annals of Natural History" a few years ago. The curious reader will, in this memoir, notice not only the detail of the proceedings themselves, but the intensely inquiring mind of the author, whilst his name is a guarantee for the correctness of his observations.

THE LEAF-CUTTER BEE.—This species of solitary bee measures about half an inch in the length of the body, the female is black, clothed with ashy coloured hairs; the jaws are large, terminated by four teeth, and the antennæ are scarcely longer than the head, and black; the wings are subhyaline, darker at the tip, with blackish veins; the legs are hairy, with the spurs testaceous, and the pollen brushes of the hind legs golden yellow. The abdomen is heart-shaped, the joints rather depressed at the base, and each with a patch of whitish hairs at the sides; the extremity of the abdomen is acute and its under side clothed with a dense golden yellow brush of hairs. The male has the body more densely clothed with yellowish hairs; the antennæ are longer than the head, the jaws are bidentate; the face with a dense yellowish beard between the antennæ, the fore-thighs outwardly at the tip dirty yellow, the abdomen oblong-subglobose, its extremity inflexed, obsoletely toothed.

This is one of the species (of which there are several) which employs particles of the leaves of the Rose tree for the lining of the cells of which its nest is composed. According to Geoffroy, it makes the burrows for its nest in old wood, and the trunks of decayed trees; but Mr. Trimmer found one in a decayed window sill, and also in the cavity of a brick wall. He also observed, that it makes use of the leaves of Mercurialis annua, as well as those of the Rose. The nest itself is cylindrical, sometimes six inches deep, consisting of six or seven distinct cells, each lined with, and separated from each other by, portions of leaves cut so as accurately to fit the required space, each of these cells being shaped like a thimble; the convex end of the second fitting closely into the open end of the first, and the third into the second, and so on, with respect to the rest. Although honey-tight, the portions of the leaves are not glued together, but simply placed in close juxtaposition. The mode in which the pieces of leaves are cut is as expeditious as if it were done with a pair of seissors, and some particular kinds of Rose trees are evidently better fitted for the operations of the bees than others; indeed we have sometimes noticed a tree of which scarce a leaf did not exhibit the marks of the bee's visits, whilst others in the neighbourhood remained untouched by them. When the bee has selected a leaf she alights upon it, sometimes upon the upper, sometimes on the lower surface, and at others upon the edge, so that the margin passes between her legs, generally also she fixes herself with her head towards the apex of the leaf. Immediately on alighting she makes an attack, keeping the edge of the leaf between her legs; those of one side being above, and the other below it, so that the section keeps giving way with her, and does not interrupt her progress. She makes her incision in a curved line. When she has nearly detached the portion she has been employed upon from the leaf, she balances her little wings for flight, lest its weight should carry her to the ground, and the very moment it parts from the parent stock, she flies off with it in triumph, bent between her legs, and perpendicular to her body. Within the cells lined with these portions of leaf, she introduces a mass of pollen paste, depositing an egg in each cell, and the larvæ, when hatched, feed upon the pollen and undergo their transformations within the cell. Figure 4, g and g represents two incisions made in the leaf by the bee, and Fig. h the bee itself engaged in making another incision.

MICROSETIA CENTIFOLIELLA.-This minute, but brilliant moth, does not measure more than one-

sixth of an inch in the expansion of the fore-wings, which, as well as the body, are of a greenish golden colour, with a purple gloss at the extremity, and the head is red, or brick red, and very woolly. Its larve are small orange-coloured grubs, destitute of legs, which reside within the substance of the leaves, forming very tortuous tracks, gradually increasing in width, with a slender black line down the middle, formed of the excrement of the caterpillar. When full grown they quit the leaf, piercing a hole through one of its dried surfaces, and contrive to crawl down the stem of the leaf till they reach some place of safety, where they form their cocoons, and where the moths are subsequently developed. Fig. 4, f represents a rose leaf with three of the burrows of the larvæ.

### PROFESSIONAL AND MORAL TRAINING.

HINTS ADDRESSED TO YOUNG GARDENERS.

BY MR. W. P. KEANE, AUTHOR OF THE "BEAUTIES OF SURREY" AND OF "MIDDLESEX."

MEAT applied to a seed is the cause of its immediate germination and growth; and to every tree, and plant, and vegetable is the cause of the rising of its sap, the budding and unfolding of its leaves and blossoms, and the ripening of its fruit and seed. What is true of one seed or tree is true of the whole of the vegetable creation. If we inquire what it is that animates and beautifies all nature, the answer will be, heat. It is by it that nature is made to assume the various changes so productive of useful results. The influences of the changes of seasons, and of the position of the sun on the phenomena of vegetation, plainly demonstrate the effects of heat on the functions of plants, The activity of chemical changes in plants is increased by a certain increase of temperature, and even the rapidity of the ascent of fluids by capillary attraction. The fermentation and decomposition of animal and vegetable substances are produced by a certain degree of heat, which is consequently necessary for the preparation of the food of plants, and as evaporation is increased as the temperature is raised, the superfluous parts of the sap are most readily carried off at the time its ascent is quickest.

Next to the solar beams, as an agent in the support of vegetable life in all its various forms, is water, which operates as a medium in conveying and imparting to the solid substances of organisation, the influence of the imponderable agents, as heat, light, and electricity, as well as that of the vital

energy itself.

As the state of moisture depends primarily on the pressure of a gaseous vapour, its quantity and its tension or elasticity is of course finally dependent on temperature, and on the agency of solar radiation. Certain plants are peculiar, as is well known, to the tropical regions where a high degree of heat prevails, with its necessary attendant, a very humid atmosphere,—whence the richness and luxuriance of organic existence in these climes. Ascending in the torrid zone from the level of the sea to the summits of the mountains, we pass through all the various climates, with their respective gradations of organised matter which each hemisphere of the entire globe presents as we proceed from the equator to the pole. This is abundantly exemplified in the floras of Nepal and Mexico.

It is sufficient for the precipitation of moisture that two portions of air of different temperatures, but each containing the full complement of vapour due to its temperature, be mixed together. The temperature speedily arrives at the mean, but the mean temperature cannot support the mean quantity of vapour, a portion of it is therefore precipitated in the form of cloud, rain, or snow, according to circumstances. Hail is produced by the falling of rain from a warmer through a colder stratum of air. Dew is formed only on the surface of the earth, and arises by the cooling of bodies by radiation; hence it occurs on the coldest portions of the best radiators, such as grass, and only on clear nights when the temperature can then fall considerably. It is most abundant in tropical countries, where the quantity of vapour in the air is greatest, and in our climate most dew occurs in autumn and spring, there being at these seasons the greatest difference between the temperature of day and night.

The atmosphere consists of oxygen and nitrogen gases, with a very small proportion of carbonic acid gas. In one hundred volumes of pure atmospheric air, there are eighty volumes of nitrogen, and twenty volumes of oxygen, and although the portion of carbonic acid is small (one part in 2500 parts of atmospheric air), it performs a very important part in the nutrition of plants. The leaves and green parts of trees, plants, and vegetables inhale it in combination with the oxygen; "but to catch this very minute quantity, the tree hangs out thousands of square feet of leaf in perpetual motion, and thus by the conjoined labour of millions of pores, the substance of whole forests of solid wood is slowly extracted from the fleeting winds."

The decay of vegetable matter in the soil proceeds only when there is an access of air and water.

The water makes soluble the vegetable matter, and converts the surrounding oxygen into carbonic acid, which is absorbed by the roots as it is formed. It is also because the earbonic acid from the atmosphere dissolves the insoluble ingredients of the soil that ploughings and hoeings, by exposing fresh surface to its influence, are so useful in fields and gardens.

### ON THE CULTIVATION OF PITCHER PLANTS.

BY MR. THOMAS BROWN, OF THE TOOTING NURSERY.

MHE true Pitcher plants constitute the genus Nepenthes of Linnæus, and several species are now known and in cultivation in this country. They are a most beautiful, and singular and interesting tribe of plants. The Pitchers form very attractive traps for insects, such as flies, wasps, cockroaches, &c., which, having once got in, very rarely make their escape; and as orchidaceous plants are subject to the attacks of various insects, no orchid-house should be without some Pitcher plants to serve as traps.

Where these plants are required to be grown to make fine specimens, they must have plenty of pot room; and the more vigorous the species, the larger the pots that will be required. The soil for potting should consist of equal parts of fibrous peat and sphagnum cut short, with a little sand, the whole intimately mixed together. Some persons are afraid to re-pot their Nepentheses after they are once established; but I never experienced any injury from doing so. The best time for potting is about the month of March. In doing it, the pots in which they are should be broken, and the ball of roots carefully put into the larger pot, the soil being carefully filled in all round nearly level with the top of the pot; then over the soil put a little living sphagnum, cut short and made level, so as to have a neat appearance. After this is done, give them a good watering with a fine rose watering-pot to settle the soil. The pots, in all cases, must be well drained with broken potsherds.

They should be placed at the hottest end of the stove, or of an orchid-house, where a bank of moss can be made of the size required in which to plunge the pots up to their rims, and deep enough to allow two or three inches of moss under the pots, to prevent them from drying. A few holes made through the slab to allow the hot air to pass upwards through the moss, thereby to cause continual evaporation about the plants, will prove beneficial. Particular attention must be paid to the watering. After they are re-potted in March, they will require watering with a fine rose watering-pot, and the moss in which they are plunged must be well saturated about twice a-week; and the plants should be syringed over head three or four times a-day. As the summer advances, and the sun acquires greater power, they will require to be syringed oftener. When the temperature has risen by the influence of the sun, in May, June, and July, perhaps from 80° to 85°, they will require syringing a dozen times a-day. The rule is, the stronger the heat the oftener they will require syringing over head. As the heat declines, decrease the moisture by degrees. In winter, if the weather is dull, syringe about once a-day; but if there is a little sun, syringe them twice or three times a-day; and the moss in which they are plunged should be well saturated about once a-week.

They must be shaded from the burning rays of the sun. I would recommend to have the glass over them painted with a little thin paint to prevent them from burning, as they are very liable to get burnt by the sun before the other plants require shading. This precaution would prevent an accident, which otherwise frequently occurs.

Pitcher plants, if grown to perfection, like a hot humid atmosphere. In summer, the temperature should vary from 75° to 80° by day, and at night from 60° to 70°. In winter, it should vary from 70° to 75° by day, and at night from 60° to 65°. The sphagnum on the top of the pots around the plants must be kept growing, and frequently clipped with a pair of scissors; and the moss must be replaced when required, in order to keep them always plunged up to the rim. They have been considered rather difficult to manage; but, by following this treatment, they will be found to thrive, and will grow without difficulty. They are propagated by cuttings and by seeds.

The principal species of Nepenthes now growing in the English gardens are the following:—

N. distillatoria, .			Native	of	China.	N. sanguinea,		. 1	Vative	of	Mount Ophis
N. Phyllamphora,			6.6	6.6	E. Indies.	N. Rafflesiana, .			6.6	4.6	Sincapore.
N. ampullacea, .			44	66	E. Indies.	N. Hookeriana, .			46	44	Borneo.
N. ampullacea pict					E. Indies.	N. javanica,			44	6.6	Java.
N. lavis,			6.6	6.6	E. Indies.	N. javanica pieta,			66	4.6	Java.
N. albo-marginata	, .	4	66	"	E. Indies.						

# ON THE EFFECT OF THE TOTAL ECLIPSE OF THE SUN, JULY 28, 1851, UPON THE VEGETABLE KINGDOM.\*

BY PROFESSOR E. MEYER, OF KONIGSBERG.

URING last winter Dr. Basch, the Director of our Observatory since the death of Bessel, gave to D our Physical Economical Society a lecture, which was soon after printed, "On the Total Eclipse of the Sun on the 28th of July, and the phenomena which are then to be expected." He says:—
"Twining plants, Mimosas, and other plants very sensitive to light, have been seen to close (during former total eclipses) and to open again at a certain time after the obscurity had passed off. In France, in the year 1842, so strong a dew was observed directly after the total obscuration, that drops could be perceived upon the margins of leaves. The thermometer began to sink, the so-called eclipsewind arose, which blew over the surface of the earth in the direction of the course of the darkness," &c.

This information rendered it my duty to take particular notice of the behaviour of sensitive plants during the ensuing total eclipse, although I could not promise myself any great results. The eclipse was to begin here in Königsberg at thirty-seven minutes and eleven seconds after three o'clock, and end at thirty-seven minutes and fifty-four seconds after five, therefore would occur at a time of the day at which many of the plants more sensible to light usually close their flowers. The total obscuration of the sun was to occur at thirty-eight minutes and five seconds after four o'clock, and only last for three minutes and one second. It seemed to me very improbable that so short a withdrawal of the light, however intense the darkness might be, would make any noticeable impression upon the plants. Experience confirmed my expectations, yet I may give a brief report of the observations.

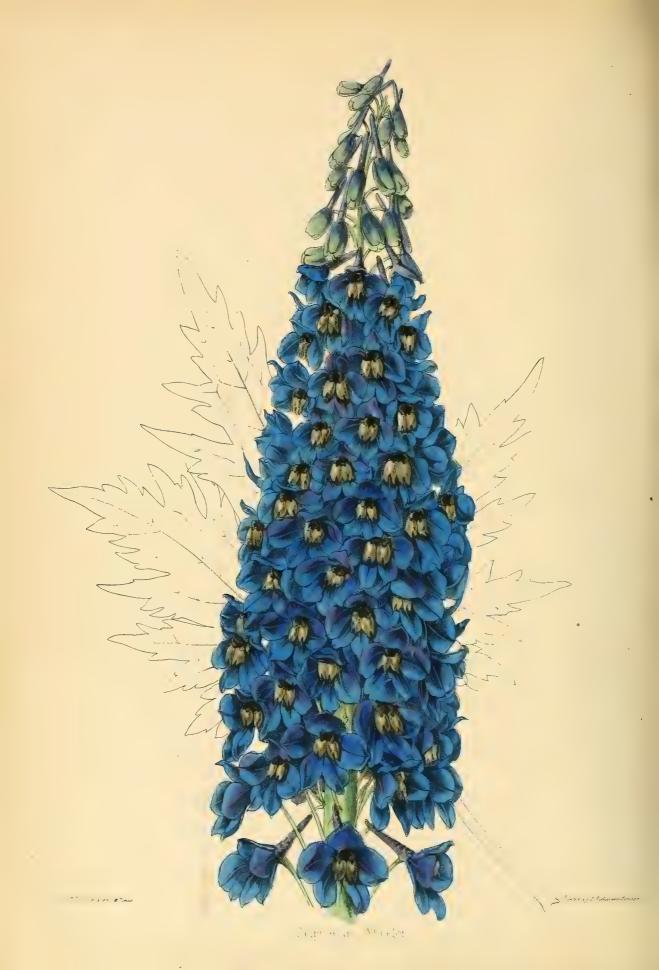
The south side of my dwelling is covered by a vine, and therefore does not radiate heat, and there I collected upon a long table all the potted plants which it appeared desirable to observe, and also some flowers which I could not arrange in pots, such as *Calystegia davurica*, in cut specimens, in glasses of water. Other plants growing in the earth were close enough to the place of observation. The thermometer was suspended on the east side of the house, within a few steps of the place where the plants stood.

At the commencement of the observations the thermometer stood at 16.1° Reaumur (about 66° Fahr.) and attained its lowest point 13.4° Reaumur (about 62½° Fahr.) about fifteen or eighteen minutes after the end of the total obscuration. From that time it rose again, and reached exactly its original point in a short time. During the total obscuration the darkness was so intense that no shadow was visible, and planets and fixed stars of the first and second magnitude were distinctly observed. In my station, sheltered from the north, but situated tolerably high, I perceived nothing of the eclipse-wind, which should have come from the north-west. Neither did any production of dew upon the plants occur. I was obliged previously to the obscuration to bring Mimosa pudica and prostrata from the open air, inside the window of a room having a south aspect, because every breath of air caused these stove-raised plants to close up. In-doors they soon opened, and the eclipse excited no influence over them; they did not close again till evening. Just as unmoved, in the open air, remained the pinnate leaves of Acacias, of Porliera hygrometrica, and others.

Many of the selected plants did not close their flowers till evening, and others before half-past three, or very soon after, when the diminution of light was scarcely perceptible, therefore proving useless for observations of this kind. Convolvulus Cneorum began to close its flowers before the eclipse, and the closing was not completed until long after it; but Calystegia davurica and Ipomea coccinea remained open until evening. Cistus laxus (the only one completely in flower) behaved like Convolvulus Cneorum, but the closing of the flowers began later, shortly before the total obscuration, and required a longer time. With regard to Helianthemum hirtum, I am doubtful whether the total eclipse acted on it; most of the flowers closed and shed their petals during it, but several not until later in the evening. The only distinct influence I observed was in the flowers of Oxalis rosea and Bridgesii. Both remained open until the total obscuration of the sun, and then closed rapidly, not, however, opening again. I made a counter-experiment with both another day. I placed them, completely open, in the shade at ten o'clock, and found them closed by eleven; I brought them again into the sun; once more I placed them in the shade with the same effect; but when I again placed them in the sun, about five o'clock, they opened no more. A reporter for the Times, who came here to observe the eclipse, but whom I have not myself met, stated that he saw Eschscholtzia californica and Nemophila atomaria close at the total obscuration. I did not observe the Eschscholtzia myself, but the Nemophila was in flower in a thick bed near me. I cannot assert that no flowers closed, but the greater part remained open until evening. I state this lest my observations should be questioned on the above authority.

<sup>\*</sup> From the Botanische Zeitung, Aug. 15.





### DELPHINIUM SPECIOSUM (?) VAR: WHEELERI.

Nat. Order .- RANUNCULACEE.

GENERIC CHARACTER.—Delphinium, Tournefort.—Calyx coloured, of five sepals, sepals imbricated in æstivation, unequal, the outermost produced into a hollow spur at the base, all deciduous. Carolla of four petals, hypogynous, free or coalescent into one piece, open above, the fifth upper petal wanting, the two lower produced at the base into appendices (internal spurs) contained in the spur of the calyx. Stamens numerous, hypogynous. Ovaries mostly three, rarely one or five, free, one-celled; ovules numerous, in two rows on the ventral suture. Capsules follicular, membranous, tipped with the styles, bursting longitudinally, at the inner side. Seeds angular, the testa spongy, membranous.—Herbs common in the temperate parts of the northern hemisphere, many Mediterranean and Eastern,

few North American; annual or perennial by a somewhat fascicled root; stems erect, branched, the leaves scattered, twice or thrice ternately divided, lobes linear, or palmately five-cut or five-parted; flowers in loose racemes or panicles, blue, purple, rose, or white, very rarely yellow.—(Endlicher Gen. Plant., 4796.)

Deliphinium speciosum, *Bieberstein*—Petioles not dilated at the base; leaves pubescent, five-lobed; lobes deeply serrated, bracts lanceolate villous, clammy; spur curved; capsules smooth.

Var. Wheeleri.—Wheeler's Bee-Larkspur.—Flowers densely crowded in large erect spike-like racemes.

DESCRIPTION.—An herbaceous perennial plant with erect branching stems, the principal one terminating in a densely spiked raceme, the lateral branches bearing looser racemes. Leaves scattered, deeply palmately divided into five segments, the lower segment on each side somewhat two-parted, so that the leaf appears almost seven-lobed; the lobes of all are somewhat wedge-shaped below and deeply inciso-serrate from the middle; the margins are ciliated, the lower face slightly hairy, especially on the veins. Racemes densely crowded with flowers borne on peduncles successively shorter upwards, and axillary to linear pubescent bracts. Calyx bright blue, spur a little curved at the apex, about as long as the limb of the calyx. Petals dark brown, the lower bifid, bearded with yellow hairs on the disk and white ones on the margin.—A. H.

HISTORY, &c.—This magnificent variety of Bee Larkspur was raised by Mr. G. Wheeler, nurseryman of Warminster, who obligingly forwarded to us last July the specimen, accompanied by several others, from which our drawing was made. All had the same kind of dense somewhat pyramidal inflorescence. In one of the specimens, somewhat larger than that which our artist has copied, the principal spike of bloom measured fourteen inches long, by eight and a half diameter at its broadest part, and we counted on this two hundred and forty-four blossoms and buds, the greater number of which were in perfection at the time we received them; below this several smaller and more loosely arranged flowering branches were produced. Mr. Wheeler informs us that the parent plant was discovered four or five years since in a batch of seedlings, which, he thinks, had been sown as D. speciosum, the seed having been of his own saving. The stems grow about three feet and a half in height, and are of so sturdy a habit, that they scarcely ever need any kind of support. Mr. Wheeler also states that it is very hardy and carries a good foliage. As there seems no reason to doubt its constancy, it must prove to be one of the most beautiful hardy garden flowers which has been for some time brought into notice.

Culture.—The culture of this tribe of plants is simple enough. The ordinary sorts, indeed, grow without difficulty in any good garden earth, which is neither saturated in winter nor parched in summer, neither of which extremes suit them. For varieties of improved breed, such as our present subject, more careful culture is, however, well bestowed. The soil prepared for it should be a light rich loam, such as a good mellow loam enriched with about a fourth part of well decomposed manure; or, where the soil is naturally of tolerably good quality, the simple addition of the manure will be all that is necessary. If fine blooms are desired, the plants must not be allowed to become dry, as they are apt to do in very hot weather. In order, too, that they may produce their bloom-spikes in perfection, the plants must be well established. Seminal varieties, such as the present, can seldom be propagated by any other means than the process of separation; but they admit of tolerably extensive increase by means of very careful division, which is, moreover, best done in spring, at the time when the plants are starting into their annual growth; the divisions should produce good strong flowering plants the following year.—M.

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### THE CHEMISTRY OF SOILS AND MANURES.

By Dr. A. VOELCKER, Professor of Chemistry in the Royal Agricultural College, Cirencester.

ON THE CLASSIFICATION OF SOILS.

WE resume the description of the different classes of soils:-

IV. Vegetable moulds (Humus soils).—Any soil containing more than five per cent. of organic matter, whatever else its composition may be, is called a vegetable mould. Soils of the most opposite physical characters and capabilities are thus grouped together in the class of vegetable moulds. These soils are clayey, loamy, or sandy, according to the predominant character of the earthy admixtures. Many are highly fertile, and these are just such as contain, in addition to the vegetable remains, all the mineral substances which plants require for their healthy growth, in sufficient quantities and in such combinations, that they are easily available as food to plants. Other soils belonging to the vegetable moulds are more or less sterile, but capable of improvement, and some contain so large a preponderance of organic matters, that they are called peaty, or boggy soils. The relative composition of fertile and sterile vegetable moulds, and of peaty soils, will become apparent by a glance at the following analyses (Nos. I., II., Mulder; Nos. III. to VI., Sprengel):-

						No. I.	No. II.	No. III.	No. IV.	No. V.	No. VI.
Organic matter and Potash Soda Ammonia Lime Magnesia Peroxide of Iron Protoxide of Iron Protoxide of Acid Sulphuric Acid Carbonic Acid Carbonic Acid Colorine Soluble Silica	•	water	(humus)			12.000 1.026 1.972 .060 4.092 .130 9.039 .350 .288 1.364 .466 .896 6.085 1.240	12.502 1.430 2.069 .078 5.096 1.40 10.305 .563 .354 2.476 .324 1.104 6.940 1.382 2.496	10.90 .01 1.00 .20 6.30 9.30 .13 .17 trace.	16.70 .06 .13 .03 .64 .78 .11 .02 .01	37.00 trace. do.  32 31 52  45 trace. do. trace.	90.44 .01 trace. .55 .08 } .12 .63 .02 .19 trace.
Insoluble Silicates Loss	(elay)		:	:	:	57.646 1.006	51.706 .935	71.80	81.50	61.57	7.96
						100.000	100.000	100.00	100.00	100,17	100.00

Nos. I. and II. Fertile soils of a tract of land in North Holland (between Nieumesluis and Aertswoude), gained by embankment

No. III. Rich vegetable mould, near Hoya on the Weser, in Germany, flooded by the river.

No. IV. Poor sandy mould, near Brunswick.

No. V. Very infertile peaty soil, near Aurich, in East Friesland.

No. VI. Boggy, very sterile land, near Giffhorn, in Germany.

V. Marly Soils.—Marly soils resemble more or less in their characters calcareous, or clay soils. They are always less retentive, less impervious than clay soils, but generally not so open and porous as many calcareous soils. On the whole, marly soils belong to the better, more productive, and more generous soils. In marly soils the proportion of lime is more than five per cent., but does not exceed twenty per cent. of the whole weight of the dry soil. Any marly soil in which a large proportion of clay is replaced by silicious sand, is called a sandy marl. Clay marl, on the contrary, is a marl in which clay preponderates.

ANALYSIS OF A MARLY SOII	FROM	THE	NEIGHBO	URI	GOOF	$_{ m OF}$	CIR	ENCEST	ER.	(DR.	A. VOELCKER.)
Organic matter and wa	ter of c	ombina	ition								10.50
Oxide of Iron and Alum	ina										11.92
Carbonate of Lime											19,92
Carbonate of Magnesia											.25
Potash											.63
Soda											.09
Phosphoric Acid .											.38
Sulphuric Acid .											.04
Finely divided Silica (se	oluble i	a caust	ic potash)								13.45
Insoluble Silicates and	sand (c	elay)									42.07
Loss											.75

VI. Loamy Soils.—The term loam is reserved to all soils which contain the four chief constituents of soils, silicious sand, clay, lime, and vegetable and animal remains in a fine state of division and intimate mixture, and in such relative proportions that the quantity of lime does not exceed five per

cent., nor that of clay fifty per cent. Loamy soils, next to the richer garden moulds, belong to the very best soils; they are easily cultivated, and yield abundant crops of almost any kind. Many alluvial deposits, which are celebrated for fertility, are loamy soils. Sandy loams, clay loams, marly loams, are terms applied to particular kinds of loamy soils, in which the physical properties of silicious sand, clay, or lime, appear more prominently than in others.

### ANALYSES OF LOAMY SOILS.

(NO. I. II., DR. ANDERSON; NO. III., DR. SPRENGEL; NO. IV., DR. PLAYFAIR.)

					1	No.	I.	No.	II.	No III	No. IV.
						Soil.	Subsoil.	Soil.	Subsoil.	140. 111.	10.17.
Silica . Peroxide of Iron				•	: }	63.1954 4.8700			73,6416 4,9230	87.143 2,220	
Oxide of Manganes	e		:	•		14.0400	14,2470		9,3830	,360 5,666	3.58
Lime Magnesia					:	,8300 1,0200	1.2756	1.3913	.7189 .8489	.564	1.12
Dotach	•		:	•		2.8001 1.4392	2.1761 1.0450	1.7142	.1540	.120	1.50
Sulphurie Acid		•		•	.	.0911	.0396 .2680	.1006	.2060	.025	.09
Phosphoric Acid Carbonic Acid	:			•		.05001	-	.1460	.1640	.060 .080	trace.
Chlorine Organic Matter	•			•		,0098 8,5508	.0200 6.8270	.0068 6.3271	.0060 5.8554	.036 3.387	2,43
Water .	•	•		•	*	2.7000	4.5750	4,4260	4.2810		loss 0.63
					1	99.8364	99.8621	100.2923	100.2185	100.000	100.000

No. I. Clay loam, resting on the old red-sandstone, situated on the north bank of the Tay, near Perth. Good wheat soil.

No. II. Excellent wheat loam, near Dunbar, Scotland.

No. III. Alluvial loam, a virgin soil, celebrated for its fertility, from the banks of the Ohio, North America.

No. IV. Sandy loam of a very productive field near Sutton, in Norfolk.

## ON THE GROWTH OF CHRYSANTHEMUMS FOR EXHIBITION.

By Mr. G. GLENNY, F.H.S.

MHE cultivation of Chrysanthemums for single blooms is totally different from the management required when the beauty of the plant is the object. By taking off the tops of the plants in July, and striking them with slight bottom heat, they will be ready for potting into five-inch pots in August, and they may stand out of doors until September, when they should be reported into the next size in rich compost formed of half good loam from rotted turf, one fourth dung from a melon bed, and one fourth decayed leaves. This is to be well mixed, and laid together a few days. In potting from one size to the other let the ball be undisturbed; and let them be watered and have all the air they can in mild weather. They will grow rapidly, but this is no object when the flower is to be cut. Let them stand near the light, and have plenty of room and no touch of frost. By no means attempt to hasten or retard them: let the bloom have its natural growth; and, if there is reason to fear they will be too forward, keep half the stock on the shady side of the house, or temporarily shade them. But as, in a collection, there will be but little danger of missing the season with some, or rather with all, it is better to let them all go on their own way, for a bloom once checked will never open freely, and a variety naturally good may be easily spoiled by sudden changes of heat and cold. It is almost better to miss altogether with a particular variety, than to attempt to advance or retard it.

As soon as the buds show, be on the look out for the side ones, that they may be taken off at an early stage and the whole strength thrown into the single flower. In this way they may be flowered thrice the size that the blooms would come in the ordinary way. The most that should be attempted is to shade the flowers from any very hot sun that may occur in October and November; and above all things, even when giving air, see that there be no wind or draft playing upon them, for wind is worse than sun to an open flower.

The plants which are to be shown as plants, should be either dwarfed for small pots, or stopped and grown the whole season pretty sharply for larger specimens. Beginning with the cuttings, which should be provided early in the year, while they are in small pots and with four pair of leaves, pinch out the heart and let the laterals grow three inches long, when they may be pinched also; and, as they advance, there will be plenty of side shoots to form a good bush. They may, during the first two months of the year, be in cold frames, covered against violent frosts, but having all the air in mild weather. If the plants are bushy enough, let them be potted into six-inch pots in the compost already

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mentioned; and, as soon as they have begun to grow fast, top some of the most vigorous shoots. In fact, begin by these means to get your plants into good order and form. In May, change them to larger sized pots—eight or nine inch ones—and let them stand in an open situation, with the benefit of all the sun, but plunged into some dry medium up to the rim of the pots, to prevent the sun from burning the sides of the pots and damaging the fibres. They need not be taken up till the beginning of October, when they may be removed into a house by themselves, or in any place where they will be kept in a strong light and be protected from winds and frosts. If the pots are pretty full of fibres they may want another shift, but, if not very full, they may be bloomed in their present pots. If they are confined and cannot be removed into others, give them at every fourth watering liquid manure, such as would be made by putting a good shovelful of thoroughly decomposed dung into eighteen gallons of water, and well stirring them together for two or three days. This will be as good as re-potting. Regulate the number of blooms so as not to have them crowded; and, above all things, take especial care that they are not at any time distressed for water during the whole period of their growth, for the certain result of this would be discolouration of the leaf or its falling off altogether.

The plant will require supports, which should be neatly put to them, so that the foliage may conceal them. The plants to show dwarf should not be detached from the tops of plants until they have made the best part of their growth in July; when they have struck well, pot them into five-inch pots, plunge them in the most open situation where they have all the sun, and take off the tops down to about three pair of eyes; this will cause them to be neat and bushy, and the open situation will prevent them from running up high. They may be continued on this spot till the beginning of September, when they may be shifted into six-inch pots, using the rich soil before recommended. Still keep them plunged, but allow no frost to touch them. Remove them to the house in October, and let them have air and moisture with plenty of light.

## New and Rare Plants.

Dendrobium villosulum, Wallich. Roughish-stemmed Dendrobe. (Paxt. Fl. Gard., ii., 82).—Nat. Ord., Orchidaceæ § Malaxeæ-Dendrobidæ.—A handsome stove epiphyte, with long slender erect stems, sparingly clothed with short black hairs, and having small linear acute leaves, and rich orange-coloured flowers in pairs from the end of the stems. The sepals and petals are linear obtuse and curved, the latter broader at the base than the former, and the lateral sepals forming a short obtuse chin; the lip linear-lanceolate three-lobed, the lateral lobes very short, the centre one having three wavy elevated lines running through the middle. From the East Indies: Tillicherry. Introduced probably about 1848. Flowers in June. The Honourable East India Company.

ALLIUM CASPIUM, Bieberstein. Caspian Onion. (Bot. Mag., t. 4598).—Nat Ord., Liliaceæ § Scilleæ.—Syn., Amaryllis caspia, Willdenow; Crinum caspium, Pallas.—A coarse-growing bulbous plant, growing erect, from "two to ten" feet high, the leaves linear-lanceolate, glaucous, produced from the root and the lower part of the stem. The stem is terminated by a nearly globose lax umbel, a span wide, of numerous pedicels, which are four or five inches long. The flowers consist of half a dozen oblong slightly acute sepals, which are green and tinged with purplish-red; the filaments are deep red, and much longer than the perianth. From the region of the Caspian, and Northern India. Introduced by Dr. Stocks, from Scinde, in 1850; though previously introduced twenty years since, but yery rare. Flowers in May. Royal Botanic Garden, Kew.

years since, but very rare. Flowers in May. Royal Botanic Garden, Kew.

Leucothöe neriifolia, De Candolle. Oleander-leaved Leucothöe. (Bot. Mag., t. 4593).—Nat. Ord.,

Ericaceæ § Ericeæ.—Syn., L. crassifolia, De Candolle; Andromeda neriifolia, Schlechtendahl; A. crassifolia, Pohl;

Agarista neriifolia, Don; A. Pohlii, Don.—A very handsome greenhouse evergreen shrub, of moderate-sized growth, furnished with remarkably coriaceous leaves, which are oblong cordate at the base, and somewhat acuminate at the point, glabrous on both sides, and minutely reticulated beneath. The flowers are in longish solitary nearly erect secund racemes from the axils of the upper leaves, and are very showy, the flowers being scated on pedicels of about their own length; the whole inflorescence is of a bright scarlet. The corollas are between ovate and urceolate, very thick and fleshy, with a moderately large limb, of five acute spreading lobes. From tropical Brazil. Introduced before 1850.. Flowers in spring. Mr. Cunningham, of Comely Bank.

Arbutus mollis, Humboldt, Bonpland and Kunth. Soft-leaved Arbutus. (Bot. Mag., t. 4595).—Nat. Ord., Ericaceæ § Ericeæ.—A handsome warm greenhouse evergreen shrub, of large size. The leaves are alternate coriaceous, oblong or oblong-lanceolate, between acute and acuminate, the margin strongly serrated, nearly glabrous above, and clothed beneath with ashy or slightly ferruginous tomentum. The secund racemes are terminal, and form a lax panicle; the rachis stout and downy, the pedicels downy and curved downwards. The corolla is large ampullaceous, or lageniform, the lower portion forming an inflated ring, the rest of the tube hemispherical, tapering into a short contracted mouth, and terminating in a limb of five short rounded lobes; the corolla is glabrous or downy, white or greenish rose-colour. From Mexico. Introduced before 1850. Flowers in June. Royal Botanic Garden, Kew.



Rhododendron Glaucum, Hooker, fil. Glaucous-leaved Rhododendron. (Hook., Sikkim Rhod., t. 18).—Nat Ord., Ericaceæ § Rhododendreæ.—A small evergreen and very handsome shrub, of the average height of two feet, with branches of the size of a goose-quill. The leaves are oblong, or broadly lanceolate, with a muero, about three inches long, and one and a half inch broad, deep green above, and remarkably glaucous beneath. The umbels of seven or eight flowers grow from the ends of the branches, the flowers being a "pale pinkish purple," the tube campanulate, more than an inch long, and about as broad across the spreading limb of five rounded emarginate lobes. The whole plant has a powerful resinous smell. From Sikkim Himalaya, on the rocky depressed ridges of Chola, Lachen, and Lachoong, at an elevation of from 10 to 12,000 feet. Introduced, we presume, in 1850. Flowers in June.

Cerasus nepalensis, Seringe. Nepal Bird Cherry. (Paxt. Fl. Gard., ii., 81.)—Nat. Ord., Drupacee.—A hardy deciduous tree, much like the common Bird-cherry. The leaves are cordate at the base, oblong, drawn out to a long acuminate point, glaucous beneath. The flowers are in spike-like racemes, white, smaller than in the common species. From Northern India. Introduced about 1848. Flowers in June. Horticultural Society of London.

PITCAIRNIA MONTALBENSIS, Linden. (Paxt. Fl. Gard., ii., 83)—Nat. Ord., Bromeliace...—A handsome Pineapple-like, stove perennial, having long linear-lanceolate leaves, smooth and shining on both sides, and spiny-toothed at the base; the flowers are produced on a short spike, on a scape as long as the leaves, and are about two inches long, and described as being scarlet-red. From New Grenada. Introduced to the Continental gardens. Flowers in?——

Eurybia alpina, Lindley. Alpine Eurybia (Paxt. Fl. Gard., ii., 84)—Nat. Ord., Asteracce § Tubuliflore-Asteree.—A hardy or nearly hardy evergreen shrub, with stout angular sub-tomentose branches, bearing alternate coriaccous, oblong-acute toothed leaves, shining above, and pallid beneath, with adpressed down. The flower-heads are in dense panieles, the ray florets dirty white. It is hardy at Exeter. From New Zealand. Introduced about 1848. Flowers in May. Messrs. Veitch of Exeter.

Catheartia villosa, Hooker, fil. Villous Catheartia. (Bot. Mag., t. 4596).—Nat. Ord., Papaveracee.—A new genus of Papaveraceæ, forming a showy, hardy, poppy-like annual, or biennial plant, clothed on the stems and leaves with long fulvous spreading hairs. The stem is round, and nearly simple. The radical leaves cordate

subpalmately or pedately five-lobed, attached by very long petioles; the upper leaves are sessile. The flowers are nodding, about a couple of inches across, and have a hirsute calyx of two sepals, four bright yellow petals, and numerous orange-coloured anthers. Its duration is not certainly known, but it is recommended to be treated as a hardy annual. From Sikkim Himalaya. Introduced in 1850. Flowers in June, ripening its seed in July. Royal Botanic Garden, Kew.

RHAMNUS HIRSUTUS, Wight and Arnott. Hairy Buckthorn (Paxt. Fl. Gard., ii. 86).—Nat. Ord., Rhamnaceæ.

—A hardy deciduous shrub, with ovate or oblong-lanceolate leaves, and small green flowers, extremely like the common Buckthorn, but having the leaves hairy beneath. From the mountains of India. Introduced before 1850. Flowers in June.

RHAMNUS CROCEUS, Nuttall. Croceous Buckthorn (Jour. Hort. Soc., vi., 217).—Nat. Ord., Rhamnaceæ.—A small evergreen, of a neat habit and appearance, but not quite hardy in the climate of London. It is much branched and thorny, with small shining ovate leaves, and small fascicles of inconspicuous flowers. From California; sea shore, near Monterey. Introduced in 1848 by Mr. Hartweg. Flowers in June. Horticultural Society of London.

CORIARIA NEPALENSIS, Wallich. Nepal Coriaria (Paxt. Fl. Gard., ii., 86).—Nat. Ord., Ochnaceæ.—A hardy trailing deciduous bush, growing ten or twelve feet high in its native country, but in England frequently cut back by frost, and then sending up strong shoots from the roots. The stems are stout, and four-cornered. The leaves are smooth, three to five nerved, oblong-acute, in opposite pairs, placed in a distichous order. The small drooping clusters of brownish-red flowers come early on the leafless branches. From the Himalayas. Introduced about 1846. Flowers in May. Horticultural Society of London.

EUCALYPTUS COCCIFERA, Hooker, fil. Cocciferous Eucalyptus (Jour. Hort. Soc., vi., 221).—Nat. Ord., Myrtaceæ § Leptospermeæ.—Syn, E. montana of the gardens.—A small tree, hardy at Exeter as a standard, and at London against a wall; it is rather ornamental. The plant is covered in every part with a thick bluish bloom. The leaves are oblong, more or less narrow, long-stalked, usually equal-sided, and commonly extended at the point into a slender awn. The flowers are in clusters of three to five together in the axils of the leaves; the calyx-tube pear-shaped, and the ray of filaments white. At Exeter, where it flowers freely, the tree looks like an apple or pear tree loaded with blossom. From Van Dieman's Land. Introduced in 1840. Flowers in June. Messrs. Veitch of Exeter.

Calycanthus occidentalis, *Hooker*. Western Allspice (*Jour. Hort. Soc.*, vi., 218).—Nat. Ord., Calycanthaceæ. —A shrub growing about six feet high, and having oblong-acuminate smooth leaves, and solitary brownish-red flowers, with a sub-acid unpleasant odour; the sepals and petals are linear-lanceolate obtuse, the outer ones spreading or rolled back, the inner erect, few, of unequal lengths, and incurved. It is said to bear a handsomer foliage than the Carolina Allspices, but without their delicious fragrance. From California, along rivulets, near Sonoma. Introduced in 1848 by Mr. Hartweg. Flowers in June and July. Horticultural Society of London.

Jasminum Lineare, R. Brown. Linear-leaved Jasmine (Hook. Ic. Plant., t. 831).—Nat. Ord., Jasminaceæ.—A pretty and fragrant, somewhat twining shrub, either pubescent or glabrous, having trifoliolate leaves, the leaflets of which are linear or linear-oblong, from two to four inches long. The flowers grow in cymose panicles, from the axils of the leaves, of which they do not reach more than one-third the length; they are small, white, numerous, and delicately fragrant. From South Australia, and the sub-tropical interior of New Holland Introduced before 1851. Flowers in summer. Royal Botanic Garden, Kew.

Epidendrum cornifolium, Lindley. Coris-leaved Epidendrum (Jour. Hort. Soc., vi. 218).—Nat. Ord., Orchidaceæ § Epidendreæ-Læliadæ.—A stove epiphyte, of no beauty, being a short dense terminal spike, of leathery pale green flowers, which have a broad roundish convex lip. The stem is furnished with narrow stiff sub-distichous leaves, which are concave and carinate. The plant is in all its parts of a tough thick leathery texture, and is generally glazed, as it were, with a shining exudation. From Central America. Introduced by G. U. Skinner, Esq, in 1849. Flowers in March and April. Horticultural Society of London.

Ceanothus cuneatus, Nuttall. Wedge-leaved Ceanothus (Jour. Hort. Soc., vi., 220).—Nat. Ord., Rhamnaceæ.—A half-hardy shrub, growing six to ten feet high, with interwoven branches. The leaves are small, oblong wedge-shaped, rarely with one or two teeth near the extremity. The small white scanty flowers are in small axillary umbels, and are not attractive. From California: Sacramento mountains. Introduced in 1848, by Mr. Hartweg. Flowers in May. Horticultural Society of London.

### HINTS ON CAMELLIA GROWING.

BY MR. R. ERRINGTON, GARDENER TO SIR P. M. EGERTON, BART., M.P., OULTON PARK.

THOUGH the Camellia is not a usual exhibition plant, it would seem to possess every eligibility for that purpose; inasmuch as its season of flowering may be easily extended over eight months of the year; and its capabilities for improvement nobody can doubt, since very considerable advances, it will be seen, have already been made, if we cast our eye over the last twenty years. Although we

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frequently meet with finely-flowered specimens, yet how often do we see overgrown ones, which either flower badly or produce inferior blossoms, or, what is still more common, are not invested with that dark rich and glossy foliage which the plant is capable of producing, and on which the beauty and exuberant appearance of this noble Chinese shrub so much depends.

The very first point I would advert to relates to the young growth, and the manner in which it ought to be produced. Most good gardeners now "force them into wood," as it is termed, and a most important proceeding it is; and, moreover, that is applied to many other shrubs besides. Some twenty to thirty years since, one of our eminent metropolitan nurserymen, at that time famed for Camellia culture, was completely puzzled to think that, although he could grow as fine plants as any one, he could not get them to blossom well. But no wonder; the plants were so vigorous at root, and kept in such a low and equable temperature, that they had never fairly done growing,—unless it were in the very dead of winter.

A liberal amount of heat, then, leading to a somewhat hasty development of parts, is not only the remedy against barrenness, but the way to produce fine blossoms. The reason seems to be, that the plant is compelled to make every effort, and to call forth every latent energy, in producing a bold character of foliage, together with a corresponding extension of the branches, thus creating vast capabilities for a high amount of elaborative power, on which, of course (all collateral matters being right) the proper organization of the blossom-bud depends.

But if it be requisite thus to force them into a very full development, it is equally essential to take speedy steps to concentrate such energies; or the plant, being vigorous, may soon burst into a second growth, fatal to a fructiferous habit. There is, I believe, but one way of accomplishing this, according to my experience; and I have had great success in their culture for many years. My maxims are,—cool them down, and forbear the application of water as long as such a withdrawal does not injure the foliage of the plant. I may here, by way of illustration, refer to the course of culture pursued by me this spring, beginning in the end of February, and carried up to the end of June.

The Camellias here are required to be constantly in blossom, from the end of October until about the middle of April; and this we manage annually, without ever lifting out individual plants to receive special treatment,—the Camellias having a house appropriated to them. Using, as I do, a vast amount of liquid manure in their culture, the plants seem to require not a moment's rest, after the most abundant blossoming, but run into a new growth, in defiance of a low conservatory temperature of from forty to fifty degrees; and, not unfrequently, only a few degrees above the freezing point in January and February. However, they are suffered to continue developing their wood buds without any extra temperature until the middle of April, or nearly so; by which period, whatever blossoms or buds remain are plucked entirely away, the plants having done sufficient duty. This spring, I plucked off some hundreds at that period, the plants having been covered with blossom in a continuous way since the month of November in the previous year.

In the middle of April, then, we changed our tactics; the heat was increased to 65—70° by day, and to 60° by night, and all the atmospheric moisture the house was capable of producing put in request. The plants were syringed several times in the day—in fact, kept almost constantly damp; and as the pots and tubs stand on a floor of cinders, a tap, which is fed by a hydraulic ram, and which is fixed in the back wall, was turned daily on the cinder surface, until a sheet of water covered the whole; and the cinders being rammed tight, the water generally remained on the surface for a few hours before disappearing.

By this treatment, coupled with a constant shading of canvas on the roof, the plants speedily became full of a new growth,—shoots in the utmost profusion springing from all parts of the trees. Liquid manure was the while most liberally applied; and my maxim is, to keep them in this close, warm, and stimulating treatment until the leaves have attained the utmost extension; and this brings us up to the second week in June, when the plants were placed on the north side of a high wall outdoors, and a canvas screen, suspended on poles, carried over them for a week, or until they became inured to the open sky.

In a few days they were withdrawn from the shade, and placed in a thoroughly exposed situation on coal ashes, always reserved for them, where they are fastened to rails or lines, to prevent the possibility of injury from the wind, as many of them range from eight to twelve feet in height.

And now may commence the slight amount of check before adverted to, although I find that I have small occasion to practise it, as most of the shoots have by this time formed their blossom-buds,—of course in an embryo state. Should, however, any prove refractory, the man who waters them has orders to deprive that subject of his rations occasionally; and this is sometimes carried so far, that the poor unfortunate actually flags for a few hours.

I deem it expedient to cease the liquid manure now for two or three weeks, or until the blossombuds are in a most decided state, using clean water. As soon, however, as the blossoming habit is confirmed, the liquid manure is resumed, and continued as long as no signs of a second growth appear. If such, however, should threaten, the partial starvation system is had recourse to again. It is not the ordinary practice to place them in the full sunshine; and neither may the plan answer well in all parts of the kingdom, for our eastern and southern counties are notorious for an amount of heat and drought in a fitful way, which is almost unknown in the north and in our western maritime parts. And, indeed, some little caution is necessary. Unless the root be in a very healthy state, plants thus situated would speedily become yellow or sickly-looking in the foliage. Such is not the case here, however. Our trees will not quail beneath the hottest sunshine, providing they are liberally supplied with liquid manure. The only thing I fear is the action of the sunshine on the sides of the tubs or pots; and this is by no means inconsiderable, and must be, when not averted, very prejudicial at We generally place some inferior shrubs, &c., before the front rank; and this rank shades the pots of the next, and so on. Still there can be little doubt that they would be much better plunged; the operation being so performed that the roots cannot possibly get hold of the medium in which they are plunged. This is easily accomplished by forming a hollow beneath by means of a few bricks; and, in addition, the very sides may be slightly isolated.

The use of liquid manure we consider indispensable to the highest point of culture. Some persons with whom I have conversed on their culture express great fears that so constant a use of such fertilizers would throw their well-potted specimens "too much into wood." And such is very possible, if the other collateral points of management are lost sight of. My liquid manure consists of guano (the Peruvian), soot, the cow-house wash, and sometimes a dash of soap-suds. We are certainly not learned enough, as yet, to be able to make a specific for every individual plant or crop, in the shape of liquid manure: both agriculture and horticulture await with anxious longings the dawning of that era. For the present, I content myself with a mixture which certainly seems to improve almost everything to which it is applied—everything, at least, which likes and deserves manurial application. We brew our materials by a rule-of-thumb procedure, which, however dissatisfactory to the theorist, is enough for our present purpose. Our brewing vessel holds about sixty gallons. We make soot-water in it first, by putting about a peck of soot to forty gallons of water, the day previous. This is well stirred up, and some quicklime added to clarify it. The next morning it is skimmed clear; and now fifteen pounds of guano (Peruvian) are dissolved in a few gallons of warm water, and added to the soot-water. Then we add about three gallons soap suds, and about twelve of the cowhouse drainings; and the whole is well stirred, left to settle, and skimmed. When ready for use, it is nearly as clear as ale. We must here, with caution, observe that the mixture, at this strength, would probably destroy life in any plant. We, however, only pour about a pint of this to an ordinary garden water-pot of water,—certainly not more than a quart; and the water-pots hold three gallons. In fact, we add merely enough to colour the water; and it gives the water an odour somewhat resembling stale rain-water, which has stood in an open vessel for a few days.

Care should be taken, in placing Camellias in a summer station out-doors, that they are placed facing the south, or nearly so. I well remember that in my practice, some twenty years since, I thought it the best plan to keep them on the north side of a wall all the summer, as much in the shade as possible. In blossoming, such plants would very frequently, when in the house, turn their best bloom away from the eye of the spectator; and no wonder. The plants being faced to the north when placed out, had been incited to turn their leaf-facings somewhat towards the south, and the buds partook of this character. Consequently the blossoms, when opening in-doors, were many of them in a wrong position to be seen.

I may here observe, that I use the liquid manure liberally, and almost constantly, whilst the bloom-buds are enlarging, and indeed through all the flowering period occasionally. Let it, however, be kept in view by those who may read these remarks, that it is perfectly clear, and what some persons would term weak. Still, however superior any other plan or plans may be, and however high a point their future culture may reach, by this plan a profusion of fine blossoms, accompanied by the most dark and glossy foliage, has been obtained here for years; and, although so much by the aid of stimulating manurial matters, yet without the slightest diminution of constitutional vigour. Indeed, the trees improve in constitution every year.

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### SEEDLING NARCISSI.

Nat. Order. -- AMARYLLIDACEÆ.

Generic Character.—Narcissus, Linnæus.—Perigone corolline, superior, salver-shaped; tube sub-cylindrical, straight; limb six-parted, the lobes equal, spreading, or reflexed. Crown of the throat (or nectary) funnel-shaped, bell-shaped, or rotate, entire or lobed, shorter or longer than the tube. Stamens six, inserted in two rows at the summit of the tube of the perigone, below the crown, included; filaments very short, free or adherent to the tube; anthers oblong, incumbent. Ovary inferior, three-celled. Ovules numerous, in the central angle of the cells, in many rows, horizontal, anatropous. Style threadlike; stigma obtuse. Capsule membranous, obtusely three-sided, three-celled, loculicidally three-valved. Seeds numerous or few, somewhat globular, with a black, wrinkled testa.—Mediterranean herbs, with tunicated radical bulbs; the scape round or angular, spathe of one leaf, split in front; flowers showy, white or yellow, very often nodding.—(Endl. Gen. Plant., 1289.)

NARCISSUS AUREO-TINCTUS (Fig. 1). — Flowers large; segments of the perianth twice as long as the cup, oblong-lanceo-late, spreading, sulphur-coloured; cup almost cylindrical, yellow, faintly tinged with orange on the margin; spathe one-flowered, about as long as the pedicel.

N. INCOMPARABILIS EXPANSUS (Fig. 2). — Flowers large; segments of the perianth oblong-obtuse, mucronate, plane, spreading, sulphur-yellow; cup short, expanded, and indistinctly lobed, bright yellow; spathe rather exceeding the pedicel.

N. BICOLOR MAXIMUS (Fig. 3).—Flowers large; segments of the perianth oblong-ovate, spreading, pale yellow; equalling the large deeper yellow, funnel-shaped cup, which is lobed and wavy at the margin; spathe one-flowered, more than twice as long as the pedicel; leaves  $\mathbf{1}_{\frac{1}{2}}$  inch broad.

ESCRIPTION, HISTORY, &c.—The annexed figures are representations of some other of the Seedling Narcissi raised by E. Leeds, Esq., of Manchester, and referred to at p. 169. The varieties now published, though perhaps less strikingly novel in appearance than those just alluded to, are yet very handsome and showy plants, and quite different from any of the kinds at present in cultivation. The most remarkable is, perhaps, N. bicolor maximus, which has leaves resembling those of Pancratium maritimum more than the foliage of a Narcissus; the flowers, too, are very large, though not possessing novelty of colour. In this respect, N. aureotinctus, with its pretty tinge of orange on the cup, is a desirable variety, though possessing a less perfect form than some others, as regards the perianth; it is remarkable also for its straight-sided cup. N. incomparabilis expansus is remarkable for the wide spreading form of its cup, and the broad flat lobes of its perianth. The variety N. bicolor maximus was obtained from bicolor, crossed either with maximus or propinquus; N. aureo-tinctus Mr. Leeds believes to have been produced between propinquus and calathinus; while N. incomparabilis expansus is the offspring of major crossed with poeticus. We are indebted to Mr. Leeds for the opportunity of publishing them.

CULTURE.—Ample directions for cultivation will be found at p. 169 of the present volume.

—M.

### THE GENERA AND SPECIES OF CULTIVATED FERNS.

BY MR. J. HOULSTON, ROYAL BOTANIC GARDENS, KEW; AND MR. T. MOORE, F.L.S., &c.

Sub-order—Polypodiacele: Tribe—Aspidiele.
Sect. I.—Symplophlebiew. Veins anastomosing.

The affinities of the species comprised in the four preceding tribes are to be recognised without difficulty in almost any stage of the development of the plant; but, however simple and natural the common distinguishing character of the tribes may be, it is obvious that, if any part on which that character is constructed is absent, an attempt at a scientific or practical arrangement must necessarily be fallacious. This is here very clearly exemplified. The extensive tribe Aspidieæ is characterized by having round or reniform, rarely oblong sori, furnished with an indusium, which is usually of the same shape. In habit and vascular structure, they have considerable analogy to those genera of Polypodieæ which have round sori; but they are distinguishable from them by having an indusium. Among the numerous species, however, there are many that have the indusium fugacious, small, membranous, and scarcely visible, except with the assistance of a lens, and then only while the sorus is in its intancy; and there are others in which it is deciduous, and soon thrown off by the swelling sori. This being so, if the fronds are not examined in an early stage, while the indusium is present, they would certainly be referred to Polypodieæ; and it is probable that many herbarium species referred to the latter tribe belong properly to the present.

TYPODERRIS, R. Brown (Aspidii, sp. of Authors).—Name derived from hypo, under, and derris, a skin; alluding to the attachment of the indusium, which is partly under the sori.

Sori round, irregular or uniserial on each side the primary veins, produced on the angles, or points of confluence, of numerous veinlets. Indusium small, calyciform, very membranous, irregularly laciniated, and fimbriate at the margin, very distinct in an early stage, but soon obliterated by the swelling sori. Primary veins pinnate; venules compoundly anastomosing, producing from their sides variously directed free sterile veinlets, which

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terminate within the arcoles. Fronds stipitate, from one to two feet high, simple, entire, or trilobate. Rhizome creeping.—This genus contains but a solitary species, native of Trinidad. It has been long known in herbaria, but only recently introduced to English gardens in a living state. In its small calyciform fimbriate indusium it is analogous to Woodsia; but in habit, aspect, and venation, it coincides best with Aspidium, from which genus

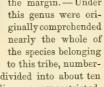
it is only distinguished by its inferior indusium. Fig. 53 represents a portion of a frond of H. Brownii (med. size).

1. H. Brownii, J. Smith.-An ornamental evergreen stove fern from Trinidad. Fronds simple or trilobate, one to one and a half foot high, light green, oblong-acuminate, lateral lobes small, middle one very large, about two to three times the length of the lateral ones, undulated, rather membranous, cordate at the base, and entire at the margin. Stipes and rachis thickly scattered over with small light-coloured scales. Fronds lateral, adherent to a scaly creeping rhizome. Sori uniserial near the primary veins, or scattered throughout the whole undersurface.

M SPIDIUM, Swartz.—Named from aspidion, a little shield or buckler; alluding to the circumstance of the sori being protected with a cover.

Sori round, reniform, or by confluence oblong, uniserial on each side the primary veins, or irregular, produced on the angles or points of confluence of several veinlets. Indusium orbicular attached by its centre (peltate), or reniform and attached by its sinus (lateral). Primary veins pinnate; venules compoundly anastomosing, producing from their sides variously directed free sterile veinlets, terminating in the areoles. Fronds simple, lobed, pinnate or bipinnate, from one to three feet long, with large

pinnæ, entire, sinuated, or laciniated on the margin. - Under



ing about two hundred. These have now been divided into about ten genera; and the characteristics of the genus Aspidium, as now restricted, are compital sori, with central or reniform indusia, and a compound anastomosing venation. Fig. 54 represents a pinna of A. trifoliatum (med. size).

Fig. 53.

1. A. trifoliatum, Swartz (Polypodium, Linnaus; A. heracleifolium, Willdenow).—An ornamental evergreen stove species, from the West Indies. Fronds glabrous, pinnate, one to one and a half foot long, rather erect, light green; inferior pinnæ petiolate, somewhat triangular trilobate, cordate at the base, lobes acuminate, middle one largest, sinuate or obtusely crenate on the margin; superior pinnæ oblongacuminate, petiolate, cordate-auriculate at the base; terminal one triangular, sinuately-pinnatifid, segments acuminate, lower ones longest. Fronds fertile throughout; terminal, adherent to a rather erect fasciculate rhizome. Stipes dark coloured, with a few scales at the base. Sori round; indusium peltate. The specific name, trifoliatum, is obviously not applicable, as there are nearly always two pairs of pinnæ on a frond, exclusive of the terminal one.

2. A. macrophyllum, Swartz.—A robust-growing evergreen stove fern, native of the West Indies and tropical parts of South America. Fronds glabrous, oblong-ovate, pinnate, two to two and a half feet long, pale green; pinnæ oblong-lanceolate-acuminate, rather membranous, petiolulate, cordate at the base, lower pair two-lobed, terminal one three-lobed, or sinuately-pinnatifid, with the lower segments long-

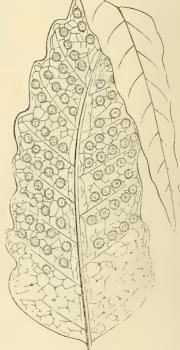


Fig. 54.

est. Sori reniform, uniserial on each side the primary veins, and frequently seated on the middle of a venule. Stipes scaly; terminal, adherent to an erect fasciculate rhizome.

MAGENIA, Prest.—Named from sagene, a large net; in allusion to the coarse reticulations of the fronds.

Sori reniform or orbicular, uniserial on each side the primary veins, or irregular, produced on the angles or points of confluence of two or more veinlets, but more generally on the apex of a free veinlet which terminates within the areoles. Indusium reniform or orbicular. Veins pinnate; venules arcuately or angularly (or in the sterile fronds compoundly) anastomosing, forming unequal areoles with variously directed free veinlets. Fronds pinnate or bipinnate, from two to four feet high; pinnæ lobed or sinuously pinnatifid.—The few species arranged here are very similar in habit and general appearance to those of Aspidium. The only technical distinction is, that the fertile fronds of Sagenia have a more simple venation, the sori being usually reniform and commonly produced on the apex of a free veinlet within the areoles, whereas, in Aspidium, the sori are usually produced on the angular crossings of a compound anastomosing venation. Fig. 55 represents a pinna of S. repandum (small size).

 S. decurrens, J. H. (Aspidium decurrens, Prest.; J. Smith).—A very singularlooking evergreen stove species, from India and Ceylon. Fronds of two kinds, sterile and fertile. Fertile fronds contracted, glabrous, rather erect, sub-pinnate, two to three feet high, yellowish-green, segments distant oblong-acuminate, crenate, lower pair two-lobed, decurrent at the base and running down near to the rhizome, forming a broad undulated wing to the rachis. Sori reniform, immersed, forming elevated protuberances on the upper surface of the frond. Stipes scaly; terminal adherent to a rather erect tufted rhizome.

2. S. repandum, Willdenow (S. platyphylla, J. Smith).—A very handsome evergreen stove Fern, from the Philippine Islands. Sterile fronds glabrous, pinnate, three feet long, bright shining green; pinnæ large, drooping, oblong-acuminate,

petiolulate, coriaceous, a foot or more long, inferior ones two-lobed, roundish at the base and entire at the margin. Fertile fronds contracted, semi-erect, repand; under side of the lower pinnæ with one or two deep segments, and crenate at the margin. Sori reniform. Stipes scaly at the

base; terminal, adherent to an erect rhizome.

3. S. Hippocrepis, Presl (Polypodium, Jacquin; Aspidium, Swartz) .-- An ornamental evergreen stove Fern, a native of the West Indies, Mexico, and New Grenada. Fronds glabrous, triangularly elongate, two to three feet high, light green, bipinnatifid; pinnæ oblong-acuminate, segments oblong, rather obtuse, and crenate at the margin. Stipes scaly at

the base; terminal, adherent to an erect rhizome. This species has been introduced to Kew, from Jamaica, in the early part of the present year.

4. S. coadunata, J. Smith (Aspidium coadunatum, Wallich).—A large growing evergreen stove Fern, from Ceylon. Fronds glabrous, trian-

gularly elongate, two to three feet long, pale green, bipinnate; pinnæ triangularly elongate, acuminate, inferior pinnules distant, superior pinnatifid, decurrent at the base, and obtusely or deeply crenate on the margin. Stipes thickly scattered over with long narrow scales at the base; terminal, adherent to a thick scaly somewhat creeping rhizome.

NOCLEA, Linnaus.—Name derived from mass, a kind of vessel, and kleis, to shut or class alluding to the kleis, to shut or close; alluding to the sori being enclosed by the peculiarly formed lobes of the fertile pinna.

Fronds of two kinds. The fertile fronds contracted; segments rugose, sessile, bacciform, oblong or sub-globose, with a membranous conniving fimbriate margin, constituting an universal indusium. Seri round, confluent, four

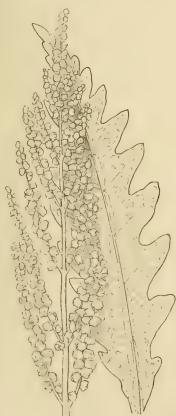
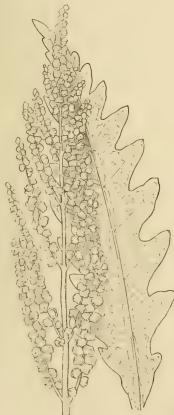


Fig. 56.





to eight in each segment; spore-cases medial, their pedicels concrete. Special indusium lateral, cucullate, and very membranous. Veins (fertile) simple direct, free; or (sterile) reticulated. Fronds pinnate or bipinnate, a foot or more high. Rhizome creeping.—One of the most peculiar examples of the occasional modifications of the sterile and fertile fronds of Ferns, is developed in this genus. It appears as though nature had bestowed a double portion of care, in preserving the reproductive organs of this singular plant. The pinnules of the fertile fronds are rolled up, so as to form concave, oblong, or sub-globose bacciform segments, which absolutely conceal the whole of the sori, which are compactly filled with confluent spore-cases. When these segments are cut open, there appears a cucullate membrane attached to the sporangiferous receptacle, on the inner side, which is analogous to what occurs in many other species of Aspidieæ; hence its relationship to this tribe, to which it bears the same affinity as Struthiopteris does to Polypodium. A solitary species only of the genus is in cultivation, and only two are described. Fig. 56 represents a portion of the sterile frond, and nearly the whole of the fertile frond of O. sensibilis (med. size).

1. O. sensibilis, Linnæus.—A hardy deciduous Fern, from North America. Sterile fronds glabrous, triangular, one to two feet high, pale green, pinnate, pinnæ oblong-lanceolate, sinuately pinnatifid, superior ones decurrent at the base, segments rather oblong, very obtuse, entire at the margin. Fertile frond contracted, nearly as tall as the sterile one, bipinnate; pinnules rugose, sessile, 12-20 on each pinna, forming an unilateral raceme of oblong, ovate, or sub-globose bacciform segments, which conceal the sori. Veins in the fertile fronds simple, direct, free; in the sterile ones reticulated. Fronds lateral, adherent to a creeping rhizome.

MYRTOMIUM, Prest (Aspidii, sp. of Authors).—Name derived from kyrtos, convex, in allusion to the curved venules.

Sori round, numerous, medial, transversely-multiserial. Indusium orbicular, attached by its centre. Veins pinnate; venules angularly anastomosing, the lower exterior one free and fertile, producing from their exterior side or angular junction, from one to three excurrent fertile free veinlets. Fronds pinnate, from one to two feet long; pinnæ oblique, falcate, entire

or spinulose on the margin.—This genus has but one representative in cultivation, and only two are at present described. In venation and in the position of the sori, it is analogous to Goniophlebium, and Cyrtophlebium, in the tribe Polypodieæ, but its habit is at variance with that of those genera, independently of it being furnished with an indusium. Fig. 57 represents a pinna of *C. falcatum* (med. size).

1. C. falcatum, Presl (Aspidium Swartz).

—A very handsome evergreen half hardy or greenhouse Fern, from Japan. Fronds lanceolate, shining, bright green, pinnate, one and a half to two feet long; pinnæ coriaceous, ovate-acuminate, falcate, repand, petiolate, somewhat round at the base, and slightly crenate at the margin. Rachis and stipes covered with very large brown scales; terminal, adherent to an erect rhizome. Sori scattered. Indusium orbicular.

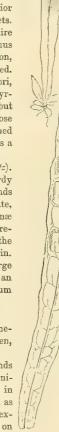
ADYENIA, Hooker.—Name commemorative of the late Dr. M'Fadyen, of Jamaica.

Fronds of two kinds. The fertile fronds contracted. Sori roundish or oblong-reni-

form, transversely uniserial, produced on the upper portion of a veinlet, in the costal arcoles. Indusium lateral, very large, and of the same form as the sori. Veins forked; venules anastomosing and reticulate, the lower exterior venule of each fascicle free and fertile.—This genus is established on a solitary Jamaica species, introduced about seven years ago. It is a dwarf-growing Fern, and is remarkable for its exceedingly large indusium, and

oblong reniform sori, which have a great resemblance to those of Didymochlæna. In venation and in the position of the sori, Fadyenia is analogous among the Aspidieæ to Goniophlebium and Synammia (a genus not











in cultivation, having oblong sori and an angularly-anastomosing venation) among the Polypodieæ. Fig. 58 represents a sterile and fertile frond, of *F. prolifera* (nat. size).

1. F. prolifera, Hooker et Bauer (Aspidium, Hooker et Greville).—A low-growing evergreen, stove Fern, from Jamaica and Cuba. Fertile frond simple, glabrous, erect, four to six inches high, lanceolate, attenuated toward the base, obtuse at the apex. Sori large reniform, imbricate near the apex. Indusium hairy and slightly dentate on the margin. Sterile frond horizontal, oblong-ovate, elongate, tapering to the apex, where it is proliferous. Fronds terminal, adherent to a small tufted rhizome. Hooker and Greville's figure in the Icones Filicum, gives a very indifferent representation of the plant.

MEPHRODIUM, Schott (Aspidii, sp. of Authors).—Name derived from nephros, a kidney, alluding to the reni-

Sori reniform, rarely orbicular, medial, uniserial on each side the primary veins, sometimes becoming confluent, and forming a continuous line parallel with the margin. Spore-cases occasionally echinate. Primary veins piunate; venules angularly-anastomosing, the lower or more pairs producing from their junction an excurrent anastomosing sterile veinlet, superior ones free. Fronds simple or pinnate, from one to four feet long. Rhizome creeping.—The characters which are selected to represent the present group, take in a rather extensive series of

species, having considerable uniformity of habit, and in the circumscription of the fronds. They are usually free-growing Ferns, natives, chiefly, of tropical or sub-tropical countries, and are not impatient of cultivation. Their proximity to Lastrea is evident; indeed they are only distinguishable from them by having an anastomosing venation, which in some species where only the lower pair of venules anastomose, might easily pass unperceived. Their affinity with Goniopteris among the Polypodieæ is so close, that if they were not furnished with an indusium, they would be referred there. The name Nephrodium literally translated, might lead to the inference that the reniform indusium was the primary character; but this is not so, since nine other genera in this tribe are furnished with indusia of the same form. The name was, indeed, originally applied by Michaux to a few North American species, and was afterwards adopted by other authors for an extensive group, which were characterized by having reniform indusia; but the genus in its present form contains a portion only of the species which were originally included, and is distinguished by the anastomosing of the venules. Fig. 59 represents a pinna of N. terminans (nat. size)

1. N. multilineatum, Presl (Aspidium, Wallich).—An evergreen stove Fern, from India and Ceylon. Fronds glabrous, pinnate, two to three feet long, rather erect, of a lively green; pinnæ lanceolate-acuminate, petiolate, sub-cordate at the base, and crenate at the margin. Sori reniform; indusium very small, and soon obliterated by the swelling sori. Venules all anastomosing, forming lines between the primary veins (hence the specific name), dividing the whole surface of the pinnæ into rectilinear parallelograms. Stipes half the length of the frond; lateral, adherent to a creeping rhizome.

2. N. unitum, R. Brown.—An evergreen stove Fern, from New Holland. Fronds glandulose, and minutely pubescent beneath, one and a half to two feet high, bright shining green, pinnate; pinnæ ensiform-lanceolate, five to six inches long, pinnatifid with semi-ovate acute segments, petiolulate and subcordate at the base. Stipes of a reddish colour when young, with a few scattered scales at the base; lateral, adherent to a creeping rhizome. This species is in cultivation under the name of N. lucens.

3. N. terminans, J. Smith (Aspidium, Wallich).—An evergreen stove species, native of the East Indies, Philippine Islands, and Ccylon. Fronds minutely pubescent on the veins on the under side, pinnate, two feet high, of a lively

green; pinnæ linear-lanceolate, pinuatifid, petiolulate, rather membranous, sub-cordate at the base, and obtusely lobed. Fronds lateral, adherent to a slender creeping rhizome.

4. N. molle, Schott (Aspidium, Swartz; A. violescens, Link).—A very free-growing evergreen, stove Fern, native of the tropics of both hemispheres. Fronds pubescent, lanceolate, one to two feet long, light green; pinned linear-oblong, acuminate, pinnatified, petiolulate; segments linear-oblong obtuse, largest next the rachis. Indusium very hairy, and of a pale violet colour. Stipes with a few seales at the base; terminal, adherent to a thick, somewhat creeping, rhizome.

5. N. articulatum, Hort.—A tall-growing evergreen stove Fern, from Ceylon. Fronds glabrous, lanceolate, four to five feet long, pinnate, deep green; pinnæ linear-lanceolate, or elongate-acuminate, pinnatitid, subpetiolate, obtusely cuncate at the base, and articulate with the rachis, which is of a pale chocolate colour. Stipes scaly; terminal, adherent to a thick creeping rhizome. This species has been six years in cultivation, and was sent to Kew by the late Dr. Gardner.

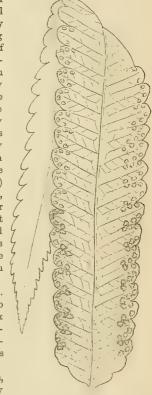


Fig. 59.

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6. N. Hookeri, Wallich.—An evergreen stove Fern, from India and the Mauritius. Fronds slender, elongate, three feet long, light green, pinnate; lower pinnæ very small, deltoid, deflexed, gradually increasing in length as they ascend the rachis, becoming on the upper half elongate-acute, pinnatifid, four inches long, sub-petiolate, auriculate, and truncate-cuneate at the base. Sori scattered on the upper half of the frond. This Fern is very rare in collections; the only cultivated frond we have seen was obligingly sent us by Mr. Henderson, of Wentworth, who obtained the plant from the Botanic Garden of Sheffield, where it was imported a few years ago among some Orchids.

# IRRIGATION BY FILTERED SEWERAGE WATER.

By Mr. J. TOWERS, Corresponding Member of Horticultural and Royal Agricultural Societies.

MHE reading public who feel an interest in the fertilizing effects produced by the application of fluid drainage, must admit that the pastures round the city of Edinburgh have solved the problem which has of late been so much studied by those connected with sanitary improvements. I propose to come nearer home, and to offer a plain recital of effects which have come under repeated observation within a mile of my residence.

The great objection to sewerage manure is the offensive odour which it in general diffuses: but that arises in almost every instance from the accumulation of fecal matters in those tanks or cesspools, wherein fermentation rapidly takes place, and from which foul hydro-sulphurous gases are extricated. If cesspools were abandoned (and this will be the case very shortly under the regulations of the Croydon Board of Health), and all the waste fluid and excretæ of every establishment made to pass away by means of glazed drain-tubes, as fast as they are produced, and then simply filtered through sand and charcoal dust, not a particle of offensive or fetid matter would exist that could taint the air for a single yard. At the establishment I have in view, the dwelling and offices stand on a hill from which there is a sharp descent to the garden. The situation furnishes a natural and easy fall for all the fluid matters that pass from the several closets, the laundry, and house sinks. These are first received in a cylindrical excavation, about half-way down the sloping bank, furnished with a quantity of loose sandy earth, which acts as a filter, to arrest any solid matters that might obstruct the flow of Below, but nearly adjoining the first receiver, is another made water tight, capable of containing several hundred gallons.. From this vessel, the now clear, and almost colourless sewerage, is distributed by moveable troughs, or iron pipes, directed, according to the object in view, to any plot or portion of the garden. Besides Asparagus, Rhubarb, large plots of Strawberries, and every required routine vegetable—any or all of which are irrigated in due course. There are portions of the ground devoted to mere experimental purposes. Thus there is a large plot of Lucerne, and another of grass, which is the peculiar object of this notice. The grass consisted of turves collected from a part of the adjoining hill, without any discrimination. It was laid down early in 1850 on the prepared surface of the garden, where the soil is naturally much better than that from whence it was raised. The sewerage was cautiously applied when growth was established, and again let on from time to time. The spring proved dry, and occasionally warm; and three cuttings with the scythe were taken between April and October, the latter inclusive. The processes have been renewed this year, and I have seen the grass thick at bottom, and from thirty inches to a yard in height. The first or second cuttings of the present year yield an average equivalent to more than 50,000 lbs. of green fodder per acre, or of 10,000 lbs. of dried hay  $(4\frac{1}{2})$  tons). Now, if this statement be correct, and the experiments pass as a standard of what the sewerage of a homestead may produce, how great would be the profit when compared with that of our ordinary pastures.

I have stated a few plain facts that have come under my own occasional inspection, and now shall appeal to the authority of Dr. Thomas Anderson, consulting chemist of the Highland Society, from whose analysis of the Edinburgh sewerage water, we obtain, perhaps, the most correct information which has as yet been given concerning the elements of such manures. The sample analysed was taken from the mouth of the sewer just as it enters the irrigated meadows near Lochend.

Organic matter,	,				43.60	grains.
Peroxide of iron	and alu	mina,			2.01	,,,
Lime,					10.50	,,
Magnesia,					2.00	"
Sulphuric acid,					6.09	12
Phosphoric acid	l,				6.14	,,
Chlorine,			,		12.20	22
Potash,					2.89	22
Soda,					13.27	22
Silica,					6.50	"

105.20 grains in the gallon.

"What is here called organic matter is the whole amount of volatile matter expelled by a red heat, It contains, however, a very large quantity of ammonia, amounting to not less than 7.7 grains in a gallon, in addition to which the organic matter contained 5.93 grains of nitrogen in the form of nitrogenous compounds."

Such we may assume as a type of the liquid sewerage of a common house drainage: as to solid matters carried off directly as they are produced, the filtering process detects only a very small proportion. The mischief that now exists is found in the nuisance created by fermentation in masses. The results of the timely application of purified drainage upon garden vegetables as well as fodder herbage are certainly great; but when the compounds exhibited in the table above given are made to enter the soil, we need not be much surprised at the fertility thus occasioned.

#### LITERARY NOTICES.

Bulfour's Phyto-Theology (Johnstone & Hunter).—For two reasons we hail with peculiar satisfaction the appearance of the present work, first, because it will be extensively instrumental in diffusing a taste for botanical pursuits in quarters where that taste had not been evinced before; and, secondly, because it will have a powerful influence in inducing those who engage in the pleasant study of God's all-beautiful works to pursue their researches in a devotional spirit, such as becomes the creature when contemplating the handiwork of the Creator. In this neat, little, admirably-illustrated volume of botanical sketches, intended to illustrate the works of God in the structure, functions, and general distribution of plants, the author gives a very lucid and popular detail of the leading, and especially the more remarkable facts in vegetable physiology, with an exceedingly interesting chapter on the relation which botany bears to various departments of science and art, and many other details of vegetable phenomena, which will be entirely new to many readers, and instructive and entertaining to all. We have seldom met with so much really agreeable botanical reading in a foolscap octavo of 240 pages, as Bulfour's Phyto-Theology contains; the pious spirit in which the work is written, and the many striking reflections that are offered on the, in many cases familiar, phenomena brought under notice, are calculated to give a healthy tone to the mind of every observer of nature. Truly does our author remark that "we may look on the broad landscape smiling in summer beauty, and speak with delight of the wonders of nature, and the goodness of a beneficent God, and follow with reverence the man of science as he displays God's wisdom and power in the creation of the universe; and yet there may be no true appreciation of the character of God, no sense of his holiness, and none of that wisdom which cometh from above." We feel an anxiety to treat our readers to many interesting passages from the work; but must, in the meantime, confine ourselves to the following observations on the flowering of plants, embracing Richter's curious detail of the "human clock," which strikes us as not having previously appeared in any English work:-

"The flowering of plants takes place at different periods of the year, and thus a calendar of the seasons may be constructed. By observing the exact time when plants in the same garden flower in different years, an indication will be given of the nature of the season, The Mezereon and Snowdrop, Hepatica, and Winter Aconite, put forth their flowers in February in this country, the Primrose and Crocus in March, the Cowslip and Daffodil in April, the great mass of plants in May and June, many in July, August, and September, the Meadow Saffron and Strawberry tree in October and November, and the Christmas Rose in December. Besides annual periods, some flowers exhibit diurnal periods of expansion and closing. On this principle Linnaus constructed what he called a floral clock, in which each hour was marked by the opening of some flower. . . . Richter, in his remarks on Linnous' floral clock, contrasts it with the periodical occupation of man at different hours of the day. 'I believe,' he says, 'the flower clock of Linneus, in Upsal (Horologium Flora), whose wheels are the sun and earth, and whose index-figures are flowers, of which one always awakens and opens later than another, was what secretly suggested my conception of the human clock. I formerly occupied two chambers in Schreeraw, in the middle of the market-place; from the front room I overlooked the whole market-place and the royal buildings, and from the back one the botanical garden. Whoever now dwells in these two rooms possesses an excellent harmony, arranged to his hand, between the flower-clock in the garden, and the human-clock in the market-place. At three o'clock in the morning the Yellow Meadow Goatsbeard opens; and brides awake, and the stable-boy begins to rattle and feed the horses beneath the lodger. At four o'clock the little Hawkweed awakes, choiristers going to the cathedral, who are clocks with chimes, and the bakers. At five, kitchen-maids, dairy-maids, and Butter-cups awake. At six, the Sow-thistle and cocks. At seven o'clock many of the ladies'-maids are awake in the palace, the Chicory in my botanical garden, and some tradesmen. At eight o'clock all the colleges awake, and the little yellow Mouse-ear. At nine o'clock the female nobility already begin to stir - the Marigold, and even many young ladies who have come from the country on a visit, begin to look out of their windows. Between ten and eleven o'clock the court ladies and the whole staff of lords of the bedchamber, the green Colewort and the Alpine Dandelion, and

the reader of the princess, rouse themselves out of their morning's sleep; and the whole palace, considering that the morning sun gleams so brightly to-day from the lofty sky through the coloured silk curtains, curtails a little of its slumber. At twelve o'clock the prince, at one his wife and Carnation, have their eyes open in their flower-vase. What awakes late in the afternoon at four o'clock is only the red Hawkweed and the night watchmen as cuckoo-clock, and these two only tell the time as evening clocks and moon-clocks. From the hot eyes of the unfortunate man who, like the Jalap plant (Mirabilis Jalapa), first opens them at five o'clock, we will turn our own in pity aside. It is a rich man who has taken the jalap, and who only exchanges the fever-fancies of being griped with hot pincers for waking gripes. I could never know when it was two o'clock, because at that time, together with a thousand other stout gentlemen, and with the yellow Mouse-ear, I always fell asleep; but at three o'clock in the afternoon, and at three in the morning, I awoke as regularly as though I was a repeater. Thus we mortals may be a flower-clock for higher beings, when our flower-leaves close upon our last bed; or sand-clocks, when the sand of our life is so run down that it is renewed in the other world; or picture-clocks, because, when our death-bell here below strikes and rings, our image steps forth from its case into the next world. On each event of the kind, when seventy years of human life have passed away, they may perhaps say, 'What! another hour already gone! how the time flies!'

"The closing of flowers also follows a periodical law. Most flowers close during darkness. Some close even in day-light. Thus the Salsafy shuts up its head of flowers about mid-day, and the Chicory about four in the afternoon. Many flowers are affected by the nature of the day as regards moisture, dryness, cloudiness, or clearness. In cloudy and rainy weather, the flowers of the Scarlet Pimpernel, called Poor-man's Weather-glass, remain closed. So also do the heads of flowers of the Daisy, Dandelion, and other composite plants. By this means the essential organs of the flower are protected from injury. The direction of the flowers of some plants seems to be influenced by the sun's rays; and the name Girasole or Sun-flower, was given from an impression that the heads of flowers inclined towards the part of the heavens where the sun was shining. This does not, however, appear to be the case with the Sun-flower as grown in this country.

"The diurnal periods in flowering are alluded to by the poet in the following lines :-

"In every copse and sheltered dell,
Unveiled to the observant eye,
Are faithful monitors who tell,
How pass the hours and seasons by.

"The green-robed children of the spring Will mark the periods as they pass, Mingle with leaves Time's feathered wing, And bind with flowers his silent glass.

"See Hieracium's various tribes
Of plumy fruit and radiant flowers,
The course of time their blooms describe,
And wake and sleep appointed hours.

"Broad o'er its imbricated cup
The Goatsbeard spreads its purple rays,
But shuts its cautious florets up,
Retiring from the noontide blaze.

"On upland shores the shepherd marks
The hour when, as the dial true,
Cichorium to the lowering lark
Lifts her soft eyes serenely blue.

"Thus, in each flower and simple bell
That in our path betrodden lie,
Are sweet remembrancers, who tell
How fast the winged moments fly!"

Fleming's Temperature of the Seasons, and its Influence on Inorganic Objects, and on Plants and Animals (Johnstone & Hunter).—It has often been remarked that the best books are those which lead people to think: this is one of them. The object of the author is to draw the attention of general readers to familiar phenomena resulting from the variations of daily and annual temperature, and other influences affecting the development and appearances of organic as well as inorganic Many of the facts noticed are indeed common-place ones; the author has chosen for illustration the everyday occurrences of rural life; and a desire to connect these with the causes which produce them has led him to restrict his illustrations, in general, to phenomena of easy access, so that "the perusal of the volume may serve to recall many hitherto neglected observations, suggest relations previously unperceived, and unfold order and harmony in scenes where all was indistinct, because a thick mist overshadowed them. That the contemplation of the subject here briefly handled is calculated to furnish a healthy and pleasing occupation, and raise the mind to Him who hath appointed the times and seasons, is a statement which the author unreservedly makes, as the result of no inconsiderable experience." A volume upon a subject of this kind, from the pen of Professor Fleming, whose name has been so long distinguished in the annals of British natural history, deserves wide circulation, as it cannot fail to prove eminently instructive to all who are in the habit of observing natural phenomena; while to those whose eyes are not open to the everyday operations of nature it will reveal a new world, pregnant with instruction, and calculated to awaken thought in every mind. To the cultivator this work must prove very useful; altogether, it forms a most convenient popular manual of meteorology, and will do much to dispel the prevalent idea that that branch of science merely consists of thermometrical and barometrical statistics, -for many really interesting investigations are embraced by meteorology besides the important and useful ones to which we have alluded .- L.





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# IPOMŒA OBLONGATA.

Nat. Order .- CONVOLVULACE.E.

GENERIC CHARACTER.—Ipomæa, Linnæus.—Calyx of five sepals. Corolla bell-shaped. Stamens included. Style one; stigma most frequently two-lobed. Ovary two-celled, cells two-seeded. Capsule two-celled.—Herbs, under-shrubs, or even trees, from all parts of the globe, especially the warmer.—(De Cand. Prodromus. ix. 348.)

IPOMGA OBLONGATA, E. Meyer MSS.—Oblong-leaved Ipomga.—Stem elongated, compressed, moderately hirsute-vil-

lous; leaves ovate-oblong, rounded at the base, acute at the apex, margin entire, ciliate, with scattered adpressed hairs on both faces, 1-2 inches long; petioles villous, 3-6 lines long; peduncles axillary, nearly equalling the leaves, one-flowered, rather glabrous, with two opposite linear bracts beneath the flower; sepals oblong; linear very acute, 4-5 lines long, subequal, rather villous, ciliated; corolla red,  $1\frac{1}{2}$  inch long, glabrous, bell-shaped.—( $De\ Cand.\ Prodr.$ , ix. 368).

ESCRIPTION.—A trailing herbaceous perennial, with large fleshy roots eighteen inches long and fifteen inches in circumference, producing numerous hairy stems, five or six feet long, bearing rather distant leaves on stalks mostly less than one inch long. Leaves 2 to  $2\frac{1}{2}$  inches long, variable in form, broadly or narrowly ovate-lanceolate or cordate-lanceolate, with scattered longish hairs on both faces, the margins fringed; the reticulations of the veins purplish and hairy on the under side. Peduncles solitary on the axils of the leaves, and not so long as them, hairy, one- or two-flowered, with a pair of linear hairy bracts near the calyx; when two-flowered, forked above the bracts and always thickened from them into the base of the calyx. Calyx of five sepals, three lanceolate and two subulate, all acute and hirsute, about eight lines long. Corolla large and bell-shaped, with a purplish-rose limb, obscurely five-angled. Stamens unequal in length, three long and two short; filaments expanded into the base and with a woolly tuft at the tip of the obtuse expanded scale-like portion. Stigma two-lobed.

HISTORY, &c.—We refer our plant with some hesitation to Drège's plant, of which we have a bad specimen, and which is smaller in all parts of the flower. But it seems not unlikely that cultivation may have modified this, as Drège's plants were gathered at an elevation of 1.500 feet. It seems near the *I. crassipes*, Hooker (*Bot. Mag.*, 4068.)—A. H.

For the opportunity of figuring this fine species of Ipomæa, we are indebted to the Rev. Thomas Rooper, of Wick Hill, Brighton, who received, in October 1849, one of its large fleshy roots from his son, Capt. E. Rooper, by whom it had been found growing in the valley of the Buffalo River, near King William's Town, in British Kaffraria. Its habit is to throw out long trailing—not climbing—stems, and no seeds were at any time found on the wild plants. Mr. Rooper describes the roots as unsightly masses, having much resemblance to an elephant's foot. At Brighton it has flowered from May to September, producing one or two flowers at every leaf-joint, and opening many flowers daily.

CULTURE.—This is a half-hardy or greenhouse species; kept in a stove it would not flower, and exposed out of doors in a pot it bloomed very indifferently, whilst it has thriven admirably in a cold frame. Mr. Smyth, the gardener at Wick Hill, describes the treatment he has given it, as follows:—"Last March I filled a cold pit with a mixture of loam, peat, and sand, in equal parts, adding a small quantity of well decomposed dung. The plant was turned out into this soil, and kept near the glass, air being admitted freely during the day in fine weather. As soon as it began to grow, abundant supplies of water were given. It flowered for the first time in May 1851, and continued to produce a profusion of blossoms until September. In the hottest days the flowers keep open until late at night, and keep their colour well. When in a dormant state, the roots should be kept nearly dry." Mr. Smyth further informs us that he has no doubt it will prove to be quite hardy, that is, of course, if planted in very sheltered situations, and where it can be kept dry during winter.—M.

# VEGETABLE TERATOLOGY.

A VARIETY OF PAPAVER WITH ANTHERS TRANSFORMED TO CARPELS.\*

By Proffessor GCEPPERT.

E CANDOLLE, in his *Organographie Vegetal*, figured a head of Papaver around which two or three of the stamens had changed into capsules. Subsequently, in 1832, I presented to the Congress of Naturalists, at Vienna, a more complete specimen of a similar monstrosity, the greater number of the

\* From the Flore des Serres.

vot., 111.

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stamens being in this case transformed into capsules more or less large. During the summer of 1839 I learned, that at some miles from Breslau, there was a whole field of Papavers metamorphosed in the manner indicated. I obtained a considerable quantity of them, in all degrees of transformation, each central capsule having round it from one to sixty small supplementary capsules, and, what is very important, ripe seeds existed, not only in the principal capsules, but also in many of the accessory ones. The following year (1850) I sowed a good number of these seeds, purposely selecting the contents of the large capsules round which were arranged the most small ones; I sowed these seeds in two different places, namely, one packet in a compartment well exposed to the sun; the second in a small sheltered garden. The result proved clearly that the metamorphosis in question was induced by circumstances the most favourable to the luxuriant growth of this species, namely, good soil, full exposure to the sun, and the greatest possible space for each plant.

In the compartment first named, the foremost part alone was unshaded; the other part, forming a partial slope, was shaded from right to left by some small bushes. At this latter point, the seed which sprung up in abundance was not at all thinned, so that the plants more crowded could not attain the



same height as those of the other portion, where there was more space for their development. Nevertheless, of eighty of the first plants (of the portion not shaded), ten only did not present any trace of metamorphosis; all the others showed it in the most varied manner, though certainly it only attained its maximum of energy in ten cases. In the portion of the ground much shaded, where the second lot of seeds had sprung up, most of the heads showed metamorphosed stamens; but the number of these latter was, in general, very limited—one, two, ten, for each central capsule, and, among sixty of these capsules, two, at the most, had from forty to fifty small supplementary ones. Moreover, when even these small capsules were very numerous, and formed a circle round the central one, there remained a tolerable number of untransformed stamens on each head. Formerly I had supposed the metamorphosis to have absorbed all the male organs of the same flower; it was owing to my not having followed the phases of this transformation, my observations having been confined to the capsules which were already mature.

The metamophorsis begins ostensibly by the appearance of a substance which, produced with the torus, is interposed and developed between the bases of the filaments of the stamens, with which it

effects a junction in the form of a ring. Subsequently this substance surrounds the principal capsule, either in part (in which case the metamorphosis only effects a small number of stamens), or entirely (when the most of the stamens are transformed). But in every case it is only the interior ranks of the stamens which become monstrous; the exterior ones preserving their normal form. As soon as the junction of the bases of the stamens attains the length of from two to three lines, the transformation of the anther to a carpel commences. At first the connective is swelled and becomes convex on the back, opening in a split in front. The exterior valves of the cells of the anther project, and become reflexed behind, in the form of wings. It is these which form the large and non-papillous border of the stigma. At the same time the external border of the partition of the anther becomes more prominent, and covered with papillæ. It is this which forms the true stigmatic line which answers to the papillous rays of the stigmatiferous disc of the normal capsule. The analogy between the two is The stigma is already formed, when the ovules have not yet appeared. Their formation begins by the dilating of the connective: this organ opens more and more in front, and its cavity, which seems bordered by stigmatic papillæ, soon shows the rudiments of the ovules. In proportion as this cavity becomes more profound (deeper) the upper part of the metamorphosed stamens takes the form of a hollow club, in which is developed by degrees the longitudinal ranks of the ovules.

Here my observations close. When the number of monstrous stamens is considerable, and, conse-

quently, close on one another, they frequently split in two, three, four, together from the base to the summit, forming thus small capsules, with two, three, or four stigmatic rays, which come much nearer the normal capsule. It often happens, also, that ordinary stamens are joined to those which are metamorphosed. The above experiments are susceptible of being repeated with new modifications, and the subject, so far from being exhausted, promises interesting discoveries in science. established, is that the monstrosity in question is perpetuated from seeds during two generations, and ought, perhaps, to receive as a distinctive title, the name of Papaver officinale, var. monstrosum. The preservation of a plant so singular and interesting is worthy of all the care of horticulturists.

# THE TRAINING OF THE PELARGONIUM.\*

T the metropolitan exhibitions there are few things which excite more surprise among the unin-A T the metropolitan exhibitions there are lew things which the training of Pelargoniums, and, strange as it may appear, even that it is a property of the property of the period of the confess their some of those who might be considered au fait in such matters, have not hesitated to confess their want of knowledge, for but a few years back, we heard the late Mr. M'Nab remark at Chiswick, "I think nothing of your Heaths, having better at home; but how those magnificent Pelargoniums are produced I cannot understand;" and certainly, when we look at the small pots, and vast mass of foliage and flowers, it does almost appear incredible that they could be so produced; and, great as may be the merit in growing a fine Heath, it is quite certain that more expense and attention is requisite to grow a comparatively fine specimen of Pelargonium. Those who have not tried the experiment will laugh at the idea of Pelargoniums requiring as much skill as Heaths; but we have grown both, and consequently can speak from experience; and we are quite sure more attention for the time is required to grow a perfect specimen of Pelargonium than to grow a specimen Heath; and it is rather remarkable that the man who may excel in the management of one plant is rarely first-rate at the other. In fact, hard-wooded and soft-wooded plants require treatment entirely distinct from each other; the first requires time and attention, the other little time, great attention, and rich manure, for it is only by much nutriment and careful management in watering, by seeing the plants receive sufficient, and yet are never glutted, that success in the management of soft-wooded plants can be rendered certain. If larger pots were allowed, less attention would be required, but merit would decrease in the same proportion, and consequently small pots are preferred. We all know that a Heath or any other hard-wooded plant with its indurated foliage, and comparatively small respiratory powers, or surface, cannot require so much aqueous support as a Pelargonium, but yet they are generally grown in larger pots, and consequently in larger masses of soil. How is this? Let those who have their management enquire, and we have no doubt the investigation will repay the trouble.

Various plans have been recommended for training the Pelargonium, and doubtless the low bushes generally seen are not of the most elegant form that could be conceived, but possibly they are the most suitable, and hence necessity, our great preceptor, has compelled us to adopt that form. Anything. however, is better than the long leggy formless things we used to see, and which in some places are seen even at the present day. The pyramidal form would certainly be the best, but nature rebels against it, and it is found impossible to get plants equally covered with bloom, or of equal growth. It is well known that the sap of a plant in its progress rises always to the most vertical point, and that in consequence it is impossible to get equal growth over the whole surface of the plant; for pinch, top, depress, or do what you will, the flow will still be upwards, and the growth must be strongest at the most vertical points, and there there will be bloom, while the lower branches will scarcely produce a flower. Even on the dwarf system of training it is found very difficult to ensure an equal distribution of sap, as some shoots, especially those upon the most central and vertical branches, are always disposed to produce the strongest shoots, and it is only by occasionally removing them, or tying the points below the level of the weaker shoots, that an equal distribution of sap and growth can be insured, therefore great watchfulness is necessary, and considerable practical knowledge to guide aright the

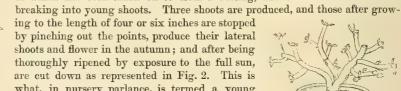
energies of the plant.

It is sometimes remarked that Pelargoniums require neither training nor staking, indeed there are certain writers who would interdict the use of stakes altogether. Such writers, however, are more to be pitied than laughed at; they belong to a race of arm-chair gardeners, who find it more convenient to teach by precept than example, and whose lucubrations are more remarkable for

<sup>•</sup> From the "Fancy Pelargonium," &c., by W. P. Ayres, C.M.H.S., now in the press.

detailing what they would do, than what they have done. Such men are useful in their way, for even slovenly gardening is better than no gardening at all. But, once for all, we may say Pelargoniums cannot be grown to any size without supports; when in free growth, a rough wind would blow them limb from limb, and as for carrying them to an exhibition without smashing them to pieces, it That less stakes than are generally used may suffice, and that they may be would be impossible. used of a much smaller size is quite true; but to attempt to carry a plant without staking is quite out of the question. Do not, however, use any more than are absolutely necessary, and let them be as thin and unobtrusive as possible. The best are the young shoots of the Snowberry (Symphoria racemosa), and the next small tough dry young Willow shoots. Either of these kinds will stand for a season, and when dry they are so tough and wiry that they may be bent in any direction, and will retain their

The annexed engravings show a set of young plants from the first start in October in small pots, up to a fully-formed plant. Fig. 1 is a young plant just purchased from the nurseries, the head of which has been taken off to form a cutting, and the buds of which are



shoots and flower in the autumn; and after being thoroughly ripened by exposure to the full sun, are cut down as represented in Fig. 2. This is what, in nursery parlance, is termed a young

Fig. 1. stool or bottom, and is the sort of plant which an amateur should select to grow into a nice specimen. In Fig. 3 we have the same plant grown another season and cut down; and here it will be seen it has added materially to its size, and has become a really fine ground-work for a specimen





plant. But to form these bottoms is not quite so easy as to write about them. Young Pelargonium shoots are formed of brittle materials, and hence considerable care and patience is necessary to get the shoots into the requisite form. We first begin with long hooked pegs, and peg the shoots into their places a little at a time, say depressing each shoot a little every three or four days until it gets into proper shape; always, if possible, taking advantage of the sunny part of the day, and allowing the plants to be rather

dry at the time. In the afternoon of a sunny day, and before watering the plants, you may take much greater liberties with the young shoots of a Pelargonium than would be safe in the morning; and hence, that time should always be chosen. When the plants get too large for pegs, small sticks of the necessary strength are used, placing them wherever it is necessary to draw the branches to, and to avoid using many stakes a band of bass, mat, or wire is passed round below the rim of the pot and made fast; a piece of fine matting or string is then tied to the various branches, and each is drawn into the position it is destined to occupy. When the branches are depressed below the level of the rim of the pot, an arrangement of this kind is indispensible, and, independently of that, it is a very neat way of accomplishing our aim. Without a properly formed stool it is impossible to get a perfect plant, and, therefore, no pains must be spared to arrange the branches properly, before they get too much crowded with foliage. Sometimes branches are liable to split in the fork, that is, where they start from the parent stem, and then, before attempting to train them, the branches must be tied together by means of strong pieces of soft matting. Thus arranged, with perseverance and patience, the plants may be made to assume any form you please, but they must be gently handled; and hence, never attempt to train a plant except when you have leisure to do so carefully, and without hurry.

In Fig. 4 we have the plant advanced another year, and it is now of a size sufficiently large for all ordinary purposes. Such a stool, with proper management, and if of a free-growing kind, such as Queen Superb, or Reine des Français, would form a plant from four to six feet in diameter, and should produce more than a thousand trusses of flowers—a sight worth seeing, and an ample recompense for the trouble that has been taken in its formation. Such stools are rarely to be bought; those who have them do not like to part from them. The stools represented in our engravings are not

ideal sketches, but actual portraits of plants growing in our own establishment, which we shall be

happy to show to any one who may call upon us. No. 2 is a young stool of Jenny Lind; 3, that delicate kind called Picturata; and 4, Queen Superb. Larger stools of the same kinds may be found, but not more perfect, than Nos. 3 and 4. Of such free-growing kinds as Queen Superb, it is possible, by sacrificing the flower, to grow a plant of the size in one season; but of Picturata, Formosa, or Fairy Queen, it would be good work to get them of the same size in three seasons. reason is this, they only produce wood-buds at, or near, the base of the shoots, and hence we have no



choice but to cut back to them; but the Queen-bred ones, as they are called, grow more vigorously, and hence may be cut much longer.

# NURSERY CALLS.

ROYAL NURSERY, SLOUGH.

IN the history of London nurseries it has frequently been remarked that their prosperity is changeable, and that after rising to great eminence some of them as enjoying to problem to nothing. able, and that after rising to great eminence some of them as quickly go back to nothing. This has been the case with the Slough Nursery;—some years back one of the most prosperous in England; then a comparative blank; and at the present time one of the most rising establishments possibly in the world; and under the practical and energetic management of Mr. Turner, we opine it will become one of the best kept in the country, so that even the Exeter nurserymen, with their cheap labour and large resources, must look to their laurels, ere a southern rival should take liberties with them. Situated in a sheltered valley, some half a mile from the Slough station of the Great Western Railway, and upon a deep rich alluvial soil, in some parts strongly impregnated with vegetable matter, it is found admirably adapted for nursery purposes; and the success which has attended and is attending Mr. Turner, in the cultivation of Dahlias, Carnations, and other florists' flowers, whereby he is beating the whole country, is sufficient evidence of its suitability. Let it not, however, be supposed that soil alone accounts for Mr. Turner's success; there is something more, a genial situation, with good air, liberal payment of men, and strict personal attention. The nursery, at least that part more immediately devoted to florists' flowers, is surrounded and divided by magnificent Yew and Holly hedges, which afford great protection from boisterous winds, and yet at the same time admit of a free percolation of air. These are advantages not to be attained in all situations, and account in some measure for Mr. Turner's remarkable and unprecedented success. The glass, at least that part of it in the nursery when Mr. Turner took it, is of rather an antiquated description, the houses being small and heavy in the roofs; but one of Hetley's ridge and furrow conservatories was erected several years back, and last year a splendid Pelargonium house. The latter is a "lean-to" of considerable size, and one of the neatest and best constructed we have seen for some time. The stage is not so near the glass as is generally considered necessary, but still the small compact plants which Mr. Turner showed through the season prove that it is possible to grow dwarf plants without their being placed close to the glass, if the other circumstances necessary to dwarf growth are observed; and we need not say how much more agreeable when in bloom they are to look upon. The Pelargoniums at the time of our visit,—the height of the Carnation season,—were cut down, and out of doors to ripen, but the stage contained a splendid set of stools of the leading fancy kinds. The young stock was very promising, and Mr. Turner is the fortunate possessor of the seedlings raised by G. W. Hoyle, Esq., and E. Foster, Esq., now about to be sent out. In the conservatory was a splendid collection of Fuchsias and some nice specimen plants of scarlet Pelargoniums, and the pink and variegated varieties. The other houses were gay with Achimenes, Gloxinias, Fuchsias, &c., and all were clean and in excellent order.

In the open grounds the Carnations and Picotees were of course the leading feature, and a more

magnificent sight it is almost impossible to conceive. The best flowers were placed under the Tulip stage, with a walk through the middle, and being very neatly arranged and contrasted together they had a very unique effect. The plants generally were in fine health and well bloomed, the names of some of the more remarkable modern kinds are enumerated below, and also of Fuchsias, Hollyhocks, &c., and being taken on the spot they may be regarded as the most desirable in cultivation. The Dahlias were remarkably strong and healthy, and the Hollyhocks in gorgeous beauty. Pinks were being propagated by the thousand, and Heartsease the same.

Among shrubs, trees, and fruit-trees, we noticed most of the leading kinds; a nice collection of variegated plants, and some promising specimens of Conifers in pots. The grounds were in splendid order, not a weed to be seen, and the walks as clean as in a gentleman's garden. On the whole, the nursery, abounding as it does in popular plants and florists' flowers, may be regarded as one of the most interesting in England, and from the end of March until October, will amply repay a visit for its floral beauty, and throughout the season for its healthy and well-assorted stock. The following are the lists adverted to above:—

#### CONIFERÆ. Abies Nordmanniana. Cupressus funebris. Pinus Montezumæ. - Douglasii. Cryptomeria japonica. Juniperus excelsa. — pendula vera. - Brunoniana. Pinus insignis. - taxifolia. - macrocarpa. Podocarpus nucifera. Cupressus macrocarpa. Sabiniana. Taxodium distichum pendulum. - Uhdeana. - Gerardiana. FUCHSIAS. Beauty of Deal (Banks). Diadem (Banks). Champion (Mayle). Cortona Honeybell Prince Arthur 66 Conspicua Standard Standard Voltigeur Nonsuch Sedonia (Smith). Gaiety Black Prince Alpha L'Elegant " HOLLYHOCKS. Mr. Charles Baron. Lady Clark. Walden Gem. General Bem. Magnum Bonum. Enchantress Rosy Queen. Napoleon. Rosea grandiflora. Sulphurea perfecta. Aurora. Sultana. Susannah. Queen of Whites. Mrs. Ferguson. Coccinea. Obscura. Rubens. Pitho. Comet. CARNATIONS. General Monk (Puxley). Crimson bizarre. Mars (Puxley). Scarlet flake. Bardolph (May). Scarlet bizarre. Falconbridge (May). Purple & pink bizarre. Justice Shallow (May). Howard (Puxley). Admiral Curzon (Eason). " Henry Kirke White (Taylor). " Madame Sontag (Puxley). Rose flake Lord Lewisham (Bunn). " Perfection (Puxley). Purple flake. Antonia (May). . .. Crimson bizarre. Princess Helena " King John " Duncan (May). 66 66 Favourite (Puxley). Poins (May). Flora's Garland (Brooks). 66 Cradley Pet (Wallis). Scarlet flake. Jenny Lind " Princess Royal (Puxley). 6.6 PICOTEES. Duke of Rutland (Hollyhoak). Purple edge. Grace Darling (Marris). Rose edge. Julio Romono (Fellowes). Red edge. Jeannette Mrs. Norman (Norman). Ganymede (Fellowes). Victoria Regina (Dodwell). Onhelia (May). Prince of Wales (Marris). Prince Arthur (Fellowes). Unexpected James 2nd (Norman). Lord Nelson (Norman). Mrs. Barnard (Barnard). Elizabeth 66 66 66 66 (Robinson). Alfred Venus (Headley). (Dodwell). 66 66 Rose edge. Queen Victoria (Green). (Youell). Alice Countess Howe (Marris). 66 66 King James (Headley).

Among the fruit-trees we noticed some nice plants of the Stanwick Nectarine.—A.

# Garden Bints for Amateurs.

#### OCTOBER.

MHE greenhouse plants are once more in their winter quarters; and, if previous directions have been attended to, they will present a clean, neat, and well-regulated appearance. Of course, crowding has been guarded against; if not, summon up resolution, and discard the inferior specimens at once. Give abundance of air both night and day; indeed, do not close the house entirely until compelled to do so by frosty weather. You must, however, guard against cold north-easterly draughts,

and also against rain. Diminish gradually the supply of water, more especially to those hard-wooded varieties which have matured their growth; but never allow a plant to feel the want of water at any time, except in cases,—as among succulent plants,—where complete starvation is necessary to ensure the setting of the bloom. Lose no time in getting the bulbs potted, if not already done, and arrange in their winter quarters the Roses and other plants intended for forcing. Few things are more useful for this purpose than Rhododendrons, Azaleas, and other American plants; and it is necessary to pot them early, so that they may draw a little root in the pots before forcing commences. Weigela rosea, Forsythia viridissima, and Spiræa prunifolia flore-pleno, are all good useful plants, and, if properly ripened, force beautifully; but unquestionably Deutzia gracilis (figured in a preceding page) will be one of our greatest acquisitions for the forcing-house. The plants in the conservatory borders may possibly require another soaking of water; but that will be the last for the season. Should wet weather send the men in-doors, do not forget that Orange-trees and Camellias always pay for careful washing.

In the Flower Garden, any plants which it is intended to preserve through the winter, as the Scarlet and Variegated Pelargoniums, Calceolarias, and the like, it will be well to get potted at once; and if you can aid them, for a fortnight or three weeks afterwards, with a gentle bottom-heat, they will amply repay you for the trouble, as it enables them to form root much sooner, and hence to become strong before the dull season sets in. The young propagated stock should also be under cover; but keep it as hardy as possible, as thus it will be better able to resist the cold of a long dull winter. Verbenas, especially such kinds as Shylock, Mrs. Mills, and other tender varieties, should be carefully looked to, as should also the more delicate of the variegated Pelargoniums. The old Pink Ivy-leaved Pelargonium is becoming a general favourite; and though of delicate growth, when properly managed and planted rather thickly, it forms a splendid mass. Mixed with Lobelia gracilis or ramosa, in the same bed, the dark flowers of the latter being allowed to lay among the variegated foliage, it forms a splendid mass; and by the same rule, we have no doubt Nierembergia gracilis or filicaulis, planted with the small scarlet Harkaway Pelargonium, would be equally beautiful. The shot silk of Verbena venosa, and the common variegated Pelargonium, has frequently been adverted to. Robinson's Defiance Verbena, mixed in the same way, is much to be admired. The system of strong contrasts is likely to come into general repute, and hence it will be wise to provide in time. The grouping system of flower-gardening, to maintain its interest, must have change; and this may be effected either by mixed and contrasted beds, or changing the form of the garden occasionally. We are advocates for changing the form of the garden, as affording a greater contrast than can be got in any other way. Where alterations are to be made, no time should be lost in proceeding with them; neither should the planting or alterations of shrubberies be delayed. This is a good time to propagate perpetual roses by cuttings. The wood is now nicely ripened; and if judiciously treated, the cuttings will form roots very quickly, and, with liberal treatment, be nice plants for bedding out next spring. We know nothing more interesting at this season than a good collection of perpetual roses; they are sweet, and very pretty, and for cutting a few plants afford a quantity of flowers.

Among Florists' Flowers, the Chysanthemum is the only thing likely to cheer us for the remainder of the year, and they will require particular attention as to watering, thinning the flower buds, and protection from frost. To grow flowers to the width of four to six inches, and proportionately strong, is not unusual in the suburbs of London, but then only one flower is allowed upon a plant. As the connecting link between the last Rose of autumn and the Camellias of our conservatories, the Chrysanthemum is deserving of special care, and if managed on the layering system, which we have before explained, they are really very little trouble. Dahlias and Hollyhocks are still good, but they cannot remain so much longer; when cut by the frost, the former may be taken up, dried, and stowed away, and the branches of the latter may be taken for cuttings. Lose no time, if the bed is in order, in getting the Tulips planted, and finish the bedding out of Pinks and Pansics, unless you follow the modern practice of keeping them in pots. Auriculas and Polyanthuses are of course in their winter quarters; take care to give them plenty of air, but avoid water over the foliage. Layers of Carnations and Picotees may be taken off and potted, or bedded out where there is superfluous stock. Give plenty of air, and avoid nursing them too much, as we are quite sure it does more harm than good.

In the Fruit Garden proceed with harvesting the crop as the various kinds are fit to gather, but if the weather remains mild do not be in too great haste, unless the fruit is quite ripe. This is a capital time to remove fruit trees, and the sooner in the month it is done the better. Proceed with pruning directly the leaves are off.

The Kitchen Garden crops are progressing satisfactorily. Do not lose a chance of earthing Celery and the Cauliflower and Brocoli crops. Manure thoroughly, trench, and prepare a good breadth of

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ground for Cabbage, and plant the strongest plants one foot apart each way, so that every alternate row, and every alternate plant in the row retained, can be pulled out for winter use. Look to young Cauliflower and Lettuce plants of all kinds, and preserve Endive from rain if the weather should become stormy. As the ground becomes vacant and the trees can be pruned, manure and trench the ground, leaving the surface as rough as possible. Potatoes must be digged if they are worth digging; but we are sorry to say, in many places, they are not worth the trouble. Store Carrots towards the end of the month, but Parsnips are best when taken fresh from the ground. If any alterations are contemplated in the Kitchen Garden, proceed with them at once, so as to get all completed before the ground gets locked up. Wheel manure soil, &c., on frosty mornings, and protect crops from severe frost. Permanent crops, as Rhubarb, Asparagus, Sea Kale, Artichokes, &c., should have the ground forked over, and receive a mulching of good dung.—P.

### THE LATE DR. NEILL OF CANONMILLS.

MHE death of Dr. Patrick Neill, which took place early in September, has cast a deep gloom over horticultural affairs in Scotland; and the loss which has thus been sustained will be felt whereever gardening and natural history are pursued. Gifted in early life with a taste for scientific pursuits, botany and horticulture became Dr. Neill's favourite studies. He was one of those who advanced the knowledge of Scotch botany, and who, along with Don and others, added many important plants to our alpine flora. Throughout life he retained a lively and deep interest in this pursuit; and his garden at Canonmills bears testimony to the zeal and success with which he cultivated the rare alpine species. But while thus an enthusiastic practical botanist, he was also a most enlightened horticulturist, and contributed much, by his exertions and writings, to promote the gardening of Scotland. He was one of the early founders of the Caledonian Horticultural Society; he acted as Secretary to that Institution for the long period of forty years, and it is mainly to his exertions that its present high position is due. With him this Society was always a favourite object, and he devoted himself to it. His exertions were crowned with success; and he lived to see the Society struggle through many difficulties, until it was placed in such a position as to ensure its stability and permanency.

Dr. Neill embraced in the range of his study all departments of natural history. He was particularly fond of zoology, and he always had in his garden living specimens of some of the rarer animals, which were objects of attention to visitors. He promoted the establishment of the Edinburgh Zoological Garden; and in his capacity of Secretary to the Wernerian Society, he had many opportunities of advancing the science of natural history. By his death one of the links has been broken which united us with the Scotch naturalists of last century. His loss will be deeply felt,-for he was beloved by all who knew him; and, with all his acquirements, he exhibited an innate retiring modesty which was peculiarly pleasing. He loved science for its own sake; and he did all in his power to promote a love for it in others. His collections were open to all; and his house at Canonmills was the

resort of every naturalist who visited the Scottish metropolis.

Perhaps no one has ever done so much for the horticulture of a country as Dr. Neill has done for that of Scotland; and no one has ever shown greater anxiety for the education and welfare of practical gardeners. Scotland has been long distinguished for horticulture, and the skill of her gardeners, much of which must be attributed to the early education which they receive. To no one was the horticulture of Scotland more indebted during the last half century than to Dr. Patrick Neill, whose decease must be a subject of deep regret to all who feel an interest in horticultural operations. In him the gardeners of Scotland have lost their best friend.

Till within a few months of his death, Dr. Neill was able to take an active interest in his favourite pursuits; and even when he felt that his strength was failing, he retained that calm equanimity which ever distinguished him, and spoke with composure of his departure from the scene of his labours. He

was buried in the Warriston Cemetery.

We understand that Dr. Neill has bequeathed to the Caledonian Horticultural Society, for which he laboured so long, a sum of £500, for the purpose of founding a medal to be awarded to distinguished Scottish cultivators.





# CROCUS VERNUS: VAR. LEEDSII.

Nat. Ord .- IRIDACEÆ.

Generic Character.—Croeus, Tournefort.—Perigone corolline, superior, funnel-shaped, the tube elongated, the limb sixparted, the interior lobes (petals) smaller, erecto-patent. Stamens three, inserted in the throat of the perigone, erect, included; filaments thread-like; anthers arrow-shaped, affixed by the base. Ovary inferior, obtusely three-sided, three-celled; outles numerous, in two rows in the inner angle of each cell, ascending, anatropous; style thread-like, elongated; stigmas three, dilated, wedge-shaped, fieshy, hooded, and finely toothed at the apex. Capsule membranous, three-sided, three-celled, loculicidally three-valved. Seeds numerous, sub-globose, the testa leathery, slightly fleshy, finely wrinkled at the hilum, the slender raphe excurrent at the apical chalaza. Embryo axile,

much shorter than the horny albumen, the radical extremity turned towards the hilum below.—Stemless herbs, native of Europe, Central Asia, and the Mediterranean region; leaves narrowly linear; flowers radical, large and showy; ovaries in some degree subterranean; certain species cultivated for the peculiar qualities of the stigmas (saffron).—(Endlicher, Gen. Plantarum, 1248.)

CROCUS VERNUS, Linnæus.—Throat of the perianth bearded, never yellow; style variable in length; stigma capitato-multifid (scape involucrate, bulb-coat reticulate).

Subrar. Leedsii.—Mr. Leeds's Crocus.—Flowers large, divisions of the perianth very broad and obtuse, deep purple, margined with white.

ESCRIPTION.—This very beautiful vernal Crocus has the habit and foliage common to its race. Its peculiarities consist in the size, form, and colouring of the flowers. The perianth is very large, its divisions remarkably broad, concave, and rounded off at the top, so as to become very obtuse at the apex and bulged out, giving a tulip-like character to the flowers when in perfection. In regard to form, it is a very striking improvement on any varieties we possess. The colouring is rich and dense, a deep violet-purple, which is set off in admirable contrast by a distinct pure white margin.

History, &c.—For the opportunity of publishing this very beautiful spring-flowering Crocus we are indebted to the kindness of its raiser, E. Leeds, Esq., of Manchester, who writes:—
"This Crocus is one out of many thousands which I raised some years ago, and the most distinct. It is probably from C. vernus, var. obovatus, crossed with some purple variety; for I took some pains in fertilizing one sort with another, When well established, the white edging is seen from a long distance, but it does not appear in perfection until the plant is in vigorous growth." The drawing was made from plants grown and established two years in a pot.

In the History of Crocuses published by the late Dean of Manchester, in the Journal of the Horticultural Society, he writes of this species thus:—

"C. vernus is one of the most widely extended Croci, and of the easiest culture, producing seeds abundantly, which grow up spontaneously. It is the Crocus of the Alps, but its flower is small there, promiscuously purple and white, or whitish, generally with the throat purple on the outside, but always white and hairy within. It reaches Cevennes, and I am told it is to be found, though rare, on the Pyrenees. It extends, with white flowers, into Carinthia, and is found white with very blunt obovate flowers, on the Bavarian Alps, sometimes assuming a blush of purple. I believe it is only found on particular spots on the Pyrenees, affecting the oolitic or Jurassic limestone. On the Alps it reaches above 5000 feet of altitude. I have seen it both white and purple from the Tyrol. The finer purple Neapolitan variety (neapolitanus) inhabits the loftiest mountains of Calabria and Lucania, not descending lower than 5000 feet. On Monte Pollino it flowers as late as June and July, reaching an elevation of 6000 feet. On the Wengern Alp, its flowers actually pierce the remaining snow in June. The Odessa variety (nivigena), which grows on part of the Steppes, is much finer, and from that stock the finest garden varieties seem to be derived. The segments of the flower are so rounded and concave, that the half expanded flower is nearly spherical. They are white, sometimes beautifully striped on the inside, or deep purple."—M.

# Argetable Physiology.

By ARTHUR HENFREY, Esq., F.L.S., Lecturer on Botany at St. George's Hospital.
RESPIRATION AND NUTRITION.

AN the last chapter we spoke of the evolution of oxygen gas from the green parts of plants, under the influence of light; this is an universal phenomenon. But if these green parts are withdrawn from the influence of light, at night for example, the nature of the interchange of elements with the surrounding atmosphere becomes completely reversed, for they absorb oxygen gas and evolve carbonic

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acid. It is stated that the quantity of oxygen absorbed in twenty-four hours varies in the leaves of different plants from one-half to eight times the volume of the leaves. The volume of the carbonic acid evolved is rather smaller than the quantity of oxygen gas taken up; when the leaves are again exposed to light they give out the oxygen gas which had disappeared.

All plants or parts of plants which are not green (fungi, roots, stems, flowers, &c.,) absorb oxygen

and give off carbonic acid, whether exposed to light or not.

It is to this double process that the term Respiration has generally been applied, although some authors have objected to it because plants possess no special respiratory organs analogous to those of animals. But in plants all the vegetative functions are spread over the whole of the active cellular tissue, instead of being localised in "systems," like the "digestive," "respirating," or other systems of animals, and therefore it is by no means to be concluded that a given process is not represented in the vegetable economy, merely because its operation is in some degree hidden, or at least complicated by its connexion with other processes in the same organs. Thus, in the leaves of plants, we have respiration, digestion, secretion, and development of new structure going on at one and the same time, and it is our business to endeavour to discriminate between the phenomena of these several processes, and to refer them to their proper laws. It probably will prove to be more correct to restrict the term respiration to the process analogous to the respiration of animals, which goes on in the absence of light, and in which oxygen is absorbed, and carbonic acid evolved. The absorption of carbonic acid and evolution of oxygen, going on under the influence of light, appears rather to be referrible to an assimilative or digestive process.

As soon as it was known that this double action existed, it became a question whether either predominated over the other, or, if so, which; whether on the whole, the plant consumed or formed a greater proportion of carbonic acid. Saussure's experiments gave a complete answer. When a plant is placed in a close vessel, with a determined volume of atmospheric air, the volume and composition are found unaltered after an equal number of nights and days: therefore, the plant forms as much carbonic acid by night as it consumes by day. But if carbonic acid be added to the atmospheric air, in which the plant vegetates, or the plant be watered with water containing carbonic acid, it gives off oxygen to the surrounding air.

The general atmosphere is constantly supplied with a great quantity of carbonic acid by decomposition, combustion, the respiration of animals, emissions from volcanoes or mineral springs, &c., and thus plants in general are placed in a condition similar to that of the latter experiments. This continual influx of carbonic acid, over and above the usual proportion, is removed by the vegetable kingdom, and replaced by oxygen. Thus, as a general statement, we may say that plants purify the atmosphere, not by increasing the oxygen gas, but by restoring to it the oxygen removed by animals, &c., through the decomposition of the carbonic acid, which is in the first instance formed at the expense of the

oxygen of the atmosphere.

Attempts have been made to determine the respective influence of these two kinds of respiration in the vital processes of vegetables, by interrupting or suspending one of them. When plants are placed in a dark place, where the want of light prevents their absorbing carbonic acid and evolving oxygen gas, their nutritive functions are disturbed and they become etiolated. They continue, however, to produce new shoots, at the expense of the nutritive matter contained in their older parts, just as the shoots are produced from tubers, like the potato; but they are longer and weaker than shoots developed under the influence of light, the leaves remain small and do not become green, and the natural characters and qualities of the juices are not brought out; bitter milky plants being sweet or tasteless under such conditions (celery, endive, &c.), and aromatic plants devoid of odour, &c. If, on the contrary, the process in which carbonic acid is consumed be stimulated, by supplying abundance of this gas to plants exposed freely to the sun's light, the nutrition is rendered more active. Even when nothing but water and carbonic acid are given them, the organic matter will increase, and the weight of this increase amounts to about double that of the weight of the carbon which was contained in the absorbed carbonic acid.

When the process of absorbing oxygen and forming carbonic acid is interrupted by placing an entire plant in an atmosphere devoid of oxygen, e.g., in nitrogen gas, or under an air-pump, all the functions of the plant are at once paralyzed. The leaf and flower-buds are arrested in their opening and rot, the leaves no longer turn towards the light, do not display the alternating movements called waking and sleeping, and sensitive leaves lose their irritability. Even isolated organs may be killed by removing them from the influence of the atmosphere, while the root of the plant survives: for instance, roots deeply buried in the earth. Plants die particularly soon when kept in the dark, in air deprived of oxygen gas; Saussure killed even a Cactus, in this way, in five days. They bear such an atmosphere

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somewhat better when exposed to the alternations of day and night, since they exhale a small quantity of oxygen by day from their own substance, and by night form carbonic acid with this, which they again decompose by day. A plant will live in this way, though with very great difficulty and without exhibiting any growth; but if the small quantity of oxygen formed by day be removed by sulphur and iron filings, or the carbonic acid by lime-water, it can form no more of these gases, and dies.

It is evident from these facts that the process, accompanied by evolution of oxygen gas, under the influence of light, is related to the nutritive processes, since the latter become abnormal when the former is interfered with; yet, the plant may survive a continuance of this interruption. But the other process, in which oxygen is absorbed and carbonic acid exhaled, occurring, moreover, in all parts of plants, is intimately connected with the life of the plant, and when the chemical changes which are produced by the action of oxygen upon the vegetable structures, and which are continually going on in all the organs, are interfered with, the plant is, like an animal, thrown into a kind of asphyxia and rapidly dies.

Thus, this latter operation, in which oxygen is consumed by plants, is far more reasonably called the "respiratory," than the former action in the green parts, in which oxygen is evolved, for this belongs clearly to the nutrient functions; and in this point of view the respiration of plants is exactly analogous to the respiration of animals, in its immediate relation to life; and oxygen gas is a true vital air to plants. The relation of the plant to the atmosphere, however, becomes somewhat more complex than that of the animal, from the fact that the former absorbs oxygen, notonly from without,

but in part from the supply prepared by its own green organs.

Water and carbonic acid being so universally distributed, plants find the principal elements of their substance (oxygen, hydrogen, and carbon,) everywhere in a condition fit to be appropriated by them; but they have not everywhere the opportunity to absorb the amount of nitrogen necessary for vigorous development; hence the important influence of nitrogenous substances in manuring. The nitrogen gas of the atmosphere seems to be an indifferent substance to plants, and it has long been assumed that they take up nitrogen in the form of solutions of organic substances or of ammonia. The latter view is supported by Liebig, who demonstrated the presence of ammoniacal vapours in the atmosphere and all rain and snow water, as well as of ammoniacal salts in the ascending sap of many trees. It has been stated by him, that the ammonia of the atmosphere suffices to supply nitrogen to wild plants, and that cultivated vegetables require a greater supply only because they are intended to produce a greater quantity of inflorescence. But it has never been shown that plants can obtain nourishment from the ammoniacal vapours of the atmosphere, and it is doubtful whether this is the case even with the ammoniacal salts in the soil, for Bouchardat's experiments go to prove that ammoniacal salts are poisonous in very minute proportions when absorbed in watery solutions by plants. Yet numerous experiments testify that the admixture of ammoniacal salts with the soil greatly favours the growth of plants. Hence it seems most probable that the ammoniacal salts form compounds with substances contained in the soil, and that those exert a different influence on the plant than that of the pure Mulder's experiments on the humous substances are exceedingly valuable in ammoniacal salts. reference to this question, and they tend to show that ammonia is always taken up by plants in combination with the organic acids of the soil (so abundant in black vegetable mould), and this would explain the difference between the poisonous action of their pure ammoniacal salts, and their favourable effect when they are mixed with the soil.

Taking all circumstances into consideration, it seems to be the legitimate conclusion that plants absorb substances furnishing nitrogen through the roots and not the leaves; while, on the other hand, the latter play the particularly active part in the absorption of the carbonic acid, which yields the

principal element of all their solid structures.

# THEORY AND PRACTICE OF PRUNING.

By Mr. H. BAILEY, GARDENER TO G. V. HARCOURT, Esq., M.P., NUNEHAM PARK.

THE PLUM.

N almost every garden we find the Plum-tree trained in the fan-shaped form, and nurserymen invariably prepare their trees for this mode of training. But, notwithstanding its general adoption, there are great objections to it for the Plum,—the more vertical and central shoots growing with a degree of vigour inconsistent with fruitfulness; and, when laid in at length, being liable to produce but few irregularly placed spurs. Something may be done to avert this result by carefully bending

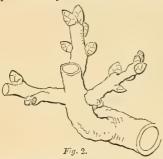
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the points of such shoots before they break. The horizontal mode of training offers the same advantages for this fruit which it does for the Pear and Apple, namely, that all the parts of the tree are more equally balanced by its adoption. As we have described the formation of the tree (under Pear), we need not here advert to it, and for those who would train in the fan-shaped manner, the instructions for the Peach are sufficient.

We have then to explain the mode of bearing, and to detail the summer and winter management of a tree, which we will suppose to be already formed upon either plan, although

we think the horizontal ought to be preferred to the fan mode.

The fruit of the Plum is produced naturally upon short spurs along the two year, three year, or older branches. Fig. 1 represents a two years' old branch, in



which a, a, a, a, are blossom-buds. Fig. 2 represents a spur from an older branch, which has received treatment in past years from the hand of the pruner. To ensure a regular supply of these fruit-bearing studs, or spurs, and to keep them as close as possible to the main branches, must be the aim of those who desire to have fruit. As the Plum is a tree which produces excessively luxuriant shoots when severely pruned, we advise the same plan of pinching the summer shoots, three or four joints in length, as we have for the Pear; instead of cutting them

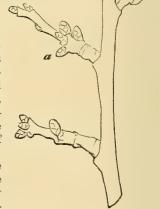
out at midsummer, almost to their bases, and also to stop the leading shoots once or twice in the growing season, according to circumstances. Trees so treated will always present a large choice of well placed fruitful buds, which will afford an opportunity of keeping the spurs shortened back so as to be close to the wall, or what is understood in our vernacular phraseology as applied to gardening matters, by the term "at home."

The Plum-tree is well adapted for forming pyramids, which are valuable adjuncts to a small garden. Root-pruning is most essential, and should be frequently resorted to.

#### THE APRICOT.

It has long been the practice to train this tree in the fan-shaped manner, and to that subject we need not revert. The fruit of the Apricot is produced upon the last year's shoots, and also upon short spurs of the shoots of former years. The latter were more generally encouraged by our older practitioners, but it is now more usual to treat the tree in a similar manner to the Peach. Our object is, therefore, to ensure a plentiful supply of young wood (and a succession of it) all over the tree. Great care should be taken to avert the necessity of removing large branches, as it is most susceptible of injury from this cause.

The reason why young wood is prefered to spurs is, that the Apricot-tree not being indigenous, but a native of "the land of the sun," is not only very excitable, but very tender, and, of course, very unsuited to withstand the rigour of our late spring frosts, alternating, as they often do, with the brilliant sunny days which we occa-



ting, as they often do, with the brilliant sunny days which we occasionally get in March. As the blossom-buds of the young shoots, when nailed or tied in, are in close contact with the wall, they are much more secure than those which are borne on projecting spurs; and hence this preference. Fig. 3 represents a branch of an Apricot-tree, in which A, A, is one year old wood, and B two years' old wood; a, a, are blossom-buds, and b, b, wood-buds. The summer pruning of Apricot-trees consists principally of the disbudding process, removing and thinning the superfluous shoots, and keeping only the well-situated, replacing shoots at a sufficient distance from each other, to permit every leaf which is retained to perform its functions. The young wood must be shortened with discretion, applying the process with less severity to strong than weak shoots, and always taking care to shorten a sufficient number of the lowermost shoots to prevent the occurrence of any blank or nakedness; in fine, to keep the tree "at home."

alway any bl The Moorpark (the best of Apricots) is very apt to lose its limbs suddenly, and thus many a fine symmetrical tree is spoiled. We opine that the mischief is occasioned by frost, in early spring, bursting the sap vessels. There are some who take a different view of the subject. For the information of those who, after pruning, nursing, and watching their fruit-trees for years, meet with this disappointment, we may mention that Mr. Rivers, of Sawbridgeworth, recommends the Gros

rouge, or large red, as "an excellent variety, hardier than the Moorpark."

#### THE CHERRY.

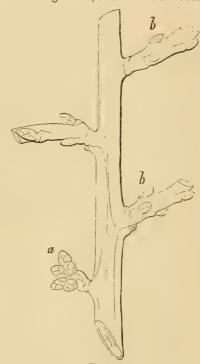
Fig. 4 represents a two years' old branch of a Cherry-tree, in which a is a natural fruit-spur, and b, b, spurs in process of formation, from the base of Fig. 5 is a spur the young wood. also, which has been subjected to pruning. It is thus evident that the fruit is borne upon the two years' old wood and that of greater age. Fan-shaped training is most in use, and nurserymen generally prepare their trees for this Having shaped the principal mode. branches into a good fan, the art of the pruner has only to deal with the spurs by cutting out the old ones and substituting others at their base, in the kinds known as the Dukes and Hearts. But some of the kinds produce very large foliage, and require the distance between the branches to be greater than usually given.

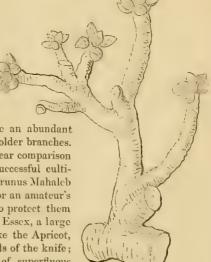
## THE MORELLO CHERRY.

This tree, like the Peach, produces Fig. 4. its fruit upon wood of the preceding year's growth, (see Fig. 6, in which a is a one year old shoot, and b a two years' old one). It is always trained in the fan-

shape, and as the object is to have a full and regular supply of shoots in all parts, our directions for the Peach fully apply also to this. The Morello Cherry produces plenty of wood, which must not be laid in too thickly, if fine fruit is desired. This fruit is sometimes cultivated as a standard, and we remember the late Mr. John Wilmot, of Isleworth, showing us an orchard of this

kind, in which the trees were annually pruned to give an abundant supply of young wood, by cutting away a portion of the older branches. The trees so treated produced large crops, which would bear comparison with the other fine products of this well known and successful cultivator. Mr. Rivers recommends working Cherries on the Prunus Mahaleb for miniature trees, and such must be beautiful objects for an amateur's garden, and not unworthy of having a small wire eage to protect them from birds. We remember to have seen, at Hylands, in Essex, a large garden of Dwarf Cherries covered over with wire. Like the Apricot, the Cherry is very susceptible of injury from large wounds of the knife; they are, therefore, to be avoided, by the timely removal of superfluous growths.





 $\alpha$ 

#### THE GOOSEBERRY.

When young Gooseberry-trees are purchased they are often found with large aggregations of suckers about the stems, which not only rob the tree of nutriment, which should be otherwise appro-

priated, but are a plague to the cultivator during the whole existence of it. All this may be avoided by proper attention to the first formation of the plant when in the state of a cutting. A young shoot, fifteen inches long, may be chosen and cut smoothly across at its base, cutting all the buds cleanly out except the three upper ones, which are intended to form the future head. This will give a clear stem of one foot in height, from which no suckers

are intended to form the future head. This will give a clear stem of one foot in height, from which no suckers will ever arise (see Fig. 7, A). We urge attention to this point from having seen it so much neglected. The three buds a a a at the top of the cutting will each produce shoots, which in the following winter may be shortened to three or four buds; these in the third year will form the skeleton of the future tree, as many being retained as circumstances and the judgment of the pruner may dictate. A well-formed Gooseberry-bush should resemble a basin in shape, and stand upon a clean stem or pedestal of one foot in height, for the purpose of keeping the fruit free from the splashing occasioned by heavy rains, which, without this precaution, would spoil much of it. All the branches should radiate from a common centre, neither crossing nor crowding each other.

The fruit of the Gooseberry is borne upon the young wood of the previous year, as also upon spurs along the older branches (see Fig. 7, B, in which a is young wood, and b b b older spurs). One great point of good management is therefore to provide a succession of well-placed bearing shoots gradually removing the old and enfeebled branches. It is well to shorten the points of the young shoots a little, as it prevents them from becoming naked of spurs at their bases, which they are apt to do, the

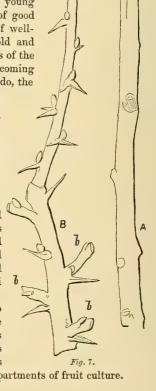
sap always flowing with greater force to terminal buds than it does to those which are situated lower down. Gooseberries are sometimes trained with tall single stems and weeping heads, or open basin-shaped ones, and sometimes as pyramids. Pretty and interesting as are these forms, they may be considered rather as ingenious displays of artistic skill on the part of the gardener, who has ample means for its development, than as really useful, or remu-

nerative in a superior degree. And then we do not find them adopted either by market gardeners or prize Gooseberry growers. Sometimes this fruit is trained upon a wall, and for this purpose we think vertical training the best form. Where the fruit of the Gooseberry is gathered green for bottling, or for tarts, the trees may be left thicker of wood than where it is intended that they should perfect their fruit, and vice versa.

In shortening back old branches care should always be taken to cut to a rising shoot, *i. e.* one whose tendency is to keep the tree upright rather than to bring it to the ground. The produce of trees thus managed will always be plentiful and good, and the advantages of order and method be as apparent in cultivating this humble fruit as

Fig. 7.

the results of our advancing knowledge are evident in the higher departments of fruit culture.



### THE RED AND WHITE CURRANT.

The directions for forming the Gooseberry-bush apply equally to the current, and its management as to pruning is much the same. It produces its finest fruit upon the young wood, and it is therefore

essential to keep up a succession of young bearing shoots, as the fruit is less good when produced on branches which have borne for several years. The fruit is much improved in size and colour by shortening the young shoots after midsummer, leaving no more foliage than can perform its proper functions, and fully exposing that which is retained to enable it to do so. The currant is a valuable auxiliary to the dessert when grown upon a north wall, and for this purpose may be trained vertically and spurred in.

#### THE BLACK CURRANT.

The form in which this tree should be trained is similar to the preceding, but as its fruit is borne principally in the young wood it is necessary to leave a larger proportion of such shoots at the time of winter pruning. The rule may be to have as many as can be exposed without shading or crowding each other. The black Naples is the best to grow. The black current does not grow so stiffly as the other sorts, and its branches are more liable to break down when laden with fruit. We find it advantageous to support a few of the branches with short stakes upon the principle that prevention is better than cure. Fruit is also produced upon small spurs on the older wood; but as these are not abundant, dependence must be placed on the young wood principally. This is more apt to produce suckers than the other kinds, and therefore the formation of the cuttings must be carefully attended to. We are not aware that any other form of growing it has been tried, excepting the bush with open centre.

#### THE RASPBERRY.

The fruit of the Raspberry is produced upon suffruticose stems, which spring from the ground, either in the same or the previous year. In most of the kinds it is produced upon lateral shoots, which are borne by the previous year's canes. This fruit shrub differs from others of its class in the stems not being persistent, but only of annual duration. They are of an herbaceous rather than a shrubby character. The object of the cultivator should be to get these annual shoots as strong as possible; and, as a multiplicity of suckers are thrown up by all the kinds (but the true yellow Antwerp, which propagates with great shyness), they must as soon as they can be seen be reduced to two or three shoots, which are to form the canes for next year's crop. Care must be taken to secure them from the action of the wind by securing them to stakes, and whenever the preceding year's crop of fruit is over, the removal of the old canes will be an advantage to the young ones. Two or three canes may be tied to a single stake at the distance of five feet each way. This distance may startle the amateur, but where it can be given it is a decided advantage; and those who cannot afford so much must bend to circumstances and do with less. At the time of winter pruning the points of the shoots may be shortened a little, and fresh stakes put to them, which completes the process for the season.

The formation of the flower-buds may be retarded, and a late crop of fruit obtained by cutting down some of the shoots to within two or three eyes of the ground. New and vigorous shoots will be produced from the eyes, which will not form their fruit till later than the others, and thus the season of this desirable fruit may be much prolonged. The double-bearing is a valuable kind, and should have They will thus give fruit the canes of the alternate stools cut down to two or three eyes annually. almost till Christmas in mild seasons. The finest fruit is in all cases produced upon the strongest and best-ripened canes. Full exposure is therefore necessary to obtain these, and single rows will, on

this account, always be found most productive.

#### THE FILBERT.

A well-managed Filbert should have a clean stem about two feet in height, and be free from suckers. The branches should radiate from this central stem, and assume a basin-like form. Its maximum of height should not exceed six feet. Filberts in Kent (a county famous for their cultivation) are generally planted as rooted suckers, which are left to grow uncontrolled for two or three years, and then cut down—a vigorous shoot results, which must be headed to the desired height, denuded of its lower buds, and only three or four shoots encouraged to grow to form the foundation of the future head. These must be shortened again at subsequent prunings till the required number of branches is obtained, introducing a hoop into the head, and regulating the distances of the main branches by means of it.

The fruit of the Filbert is produced upon the upper part of the young shoots, and upon small branches which spring from the part at which the shoots of the preceding year were shortened. male blossoms (catkins) are produced separately from the female ones (Fig. 8 A represents a shoot in which a a are female flowers, and b the male ones). In pruning, care must be exercised to leave a sufficient supply of these male blossoms for the fecundation of the female ones; and therefore the trees should not be pruned till early in the spring, when their developement is obvious. A crop of the fruit

is often lost for want of attention to this; and it has been found by experiment that where a tree has itself been deficient in the supply of these, the cutting them from other trees, and suspending them over the females, has

from other trees, and suspending them over the females, has resulted in producing a good crop. The pruner must therefore ensure an annual supply of these small productive twigs.

In the third year the last year's shoots left to form the

In the third year the last year's shoots left to form the head of the tree, will make lateral shoots, which must be suffered to grow during the season, and cut back to short spurs, from which the future bearing-wood is destined to spring. The leading shoot must also be shortened two-thirds of its length to ensure its breaking regularly, and keep it full of spurs. The subsequent management consists in shortening the young leading shoot, and cutting out old and barren wood, so as always to have a succession of young, healthy, and fruitful twigs. When the trees become too large every other one may be cut back to within six inches of the stem from which they spring; young shoots will again put forth, which must be treated in the same manner as the young tree. Fig. 8 B represents a bearing branch from a Filbert bush which has been pruned.

It is the practice to plant Apple-trees and Hops in Kent with the Filberts, but in our opinion light and air are of as much consequence to Nuts or Filberts as to other plants. We are accustomed to see the Hazel grown under a direct canopy of umbrageous timber trees; but should we not get larger returns if underwood were grown in one plantation and trees in another, and would not single rows of Filberts, minus large Apple-trees, be more productive, and yield fruit of a larger size and better quality under the influence of light and air, than they do when overwhelmed by a dense canopy of foliage?

# THE PALMYRA PALM.

We have lying before us an octavo brochure, of 92 pages, by W. Ferguson, Esq., entitled "Description of the Palmyra Palm of Ceylon," printed at Ceylon, and illustrated by several woodcuts, the drawing and engraving of which have been executed by native artists. It is remarkable as the first illustrated work published in Ceylon, and is indeed very creditable to those who have produced it. The author gives a most interesting account of the Palm, and its uses and products, correcting many popular errors, and embodying a great mass of valuable miscellaneous information, collected from original sources during a ten years' residence in the island. We venture

to call it the best account of the Palmyra which has been published. It is, we understand, Mr. Ferguson's intention, on his return to Ceylon, to publish similar descriptions of the other familiar plants of that island; and we hope he may meet with sufficient encouragement to induce him to do so. We have little space for extract, but must quote the following brief notice of a many-headed Palmyra:—

"The Dragon tree of Teneriffe divides into several branches, and the Doum Palm of Upper Egypt (Hyphane coriacea) is dichotomous, or divided into regular pairs of branches, but the departure of our Indian species from their normal state is very rare, indeed; however, the phenomenon of a several-headed Palmyra is sometimes met with. The first one the writer saw was some years ago, on Mr. Hardy's estate at Jaffna. It was a male tree, having four heads then upon it, with marks where three or four others had been. These divisions began about twenty-five or thirty feet from the ground. Other specimens are found in the Peninsula, on the Island of Delft, and on the smaller islands near Jaffna, and the writer saw one near Oodoville with six heads on it. One of these grew nearly in a line with the body of the tree, while the other five grew out from the side of this one, all from the same centre, but bending somewhat outwards before they could attain their upright position. There are marks where three others had been. The tree mentioned by Mr. Forbes in his Oriental Memoirs as having forty heads was probably a Palmyra."

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Fig. 8.





## ÆSCHYNANTHUS SPLENDIDUS.

Nat. Order. - Gesnerace & Cyrtandreæ.

Generic Character.—Æschynanthus, Jack.—Calyx tubular, five-toothed, equal. Corolla hypogynous, tube sub-incurved, throat dilated; limb two-lipped, the upper lip erect, two-lobed, the inferior three-toothed, the lobes sub-equal. Stamens inserted on the tube of the corolla, four, didynamous, exserted or included; filaments thread-like; authers affixed by the base, two-celled, cohering in pairs; the fifth posterior stamen included, without an anther. Ovary surrounded by a fleshy hypogynous ring, almost spuriously four-celled, the two placentas being stipitate on a parietal lamina, broad, contiguous to the axis, many-ovuled on the revolute margins; style simple; stigma club-shaped, with two lamelle. Capsule stalked on the base of the calyx, elongate, siliquiform, pseudo-four-celled two-valved, the valves bearing in their middle the placentas, which are at length spread out, and bear the seeds on their

margins. Seeds numerous, pendulous, affixed by the apex of the nucleus, with one hair at the base, and one-, two-, and many hairs at the apex.—Twining or climbing shrubs, from tropical Asia, rooting at the thickened joints; leaves opposite, stalked, leathery, and somewhat fleshy, quite entire; flowering stems, axillary, solitary, two-flowered, more rarely terminal umbellate; pedicels with two bracteoles; flowers showy, orange-scarlet, viscid-hairy.—(Endlicher Gen. Plant., 3134.)

Eschynanthus splendids.— The Splendid Eschynanth.— Erect; leaves elliptic-lanceolate, much acuminated, entire, somewhat undulated on the margin; flowers in terminal fascicles; segments of the calyx lanceolate, ciliated at the tip, the posterior one smaller; corolla (3 in.) clavate, curved, pubescent, orange coloured below, vermilion upwards; stamens and style much exserted; style at length exceeding the stamens.

ESCRIPTION.—A very beautiful stove shrub, of erect branching habit, with smooth terete branches. Leaves ternate (? always) the uppermost approximate, almost whorled, somewhat fleshy, elliptic-lanceolate, very much acuminated, entire, undulated on the margin, having a thick fleshy midrib, and attached by a short thick petiole. Flowers in an umbel-like terminal fascicle, seated among linear bracteoles. Peduncles erect, five-ribbed, about half an inch long, one-flowered. Calyx five-parted, the segments lanceolate, erect, smooth, ciliated at the tips, the posterior one smaller. Corolla tube three inches long, clavate, curved downwards at the end, there convex at the back and channeled in front, pubescent, rich orange-coloured below, deepening upwards into a rich vermilion red; limb two-lipped: the upper small, of two erect squarish lobes, light scarlet, with a bar of deep purple crimson down the centre of the inner face: the lower of three larger sub-spreading ovate or bluntly triangular lobes, nearly covered inside by a triangular blotch of deep purple erimson or maroon; the throat or interior of the tube orange-coloured. Stamens and style much exserted; the stamens when young connected in pairs by the oblong anthers; the style at length exceeding the stamens, glabrous below, downy above, curved at the top behind the flattened spreading transversely grooved stigma.

History, &c.—A hybrid production, and a very beautiful one, raised by Messrs. Lucombe Pince and Co., of Exeter, to whom we are indebted for the specimens from which our drawing was made. It was raised, as we are informed, from Æ. speciosus, impregnated by Æ. grandiforus, and possesses the abundant-flowering habit and erect growth of the former, and in brilliance of colour and marking even exceeding the latter. It is no doubt the finest of its race, which, as is well known, now contains many very splendid imported species. We were informed by Mr. Pince that his specimen plant of this hybrid had a bunch of flowers upon every shoot, the bunches in the specimens sent us numbering upwards of a score of blossoms. This plant had been grown all the summer in a cold pit without any artificial heat whatever. No doubt it will prove a most useful ornamental plant of very easy culture, and the brilliance of its larger clusters of flowers will make it conspicuous even among the most showy plants. The flowers were communicated to us early in October last.

Culture.—The species of Æschynanthus require stove heat, and a compost abounding in vegetable matter, with abundant drainage. They are readily propagated by cuttings placed in a brisk heat. The subject of our present illustration, being of erect and sturdy growth, will be more suitable for cultivation in pots, than in suspended baskets, which is the most natural way of growing the more slender trailing-stemmed kinds.

Beautiful as are the majority of the species of Eschynanthus, it seems likely that the process of hybridization, which has rewarded Mr. Pince with the £. splendidus, will effect other improvements among this race of plants. In particular, it is fair to presume that the dingy green-flowered kinds known in gardens under the names of £. atrosanguineus and zebrinus, which produce interesting foliage, might by this means have more brilliant blossoms superadded.—M.

vol. III.

# THE GENERA AND SPECIES OF CULTIVATED FERNS.

BY MR. J. HOULSTON, ROYAL BOTANIC GARDEN, KEW; AND MR. T. MOORE, F.L.S., &c.

Sub-Order-Polypodiacem: Tribe-Aspidiem (continued).

SECT. II. Orthophlebieæ.-Veins free.

MOODSIA, K. Brown.—Name commemorative of Joseph Woods, a British botanist, author of a monograph of the British Roses and of the Tourist's Flora.

Sori round, terminal or medial, distinct in an early stage, but subsequently becoming more or less confluent. Indusium calyciform, nearly entire, or deeply laciniated, the laciniæ usually terminating in long hairs which involve the spore cases. Veins simple or forked, free. Fronds bi-tri-pinnatifid, from two inches to a foot or more long, glabrous, pilose, or squamiferous.—A few hardy, or half-hardy, rather low-growing, deciduous Ferns



Fig. 60.

quamiterous.—A few hardy, or harr-hardy, rather low-growing, deciditous Ferns constitute this genus, and among them are two of our indigenous species. Their fronds being hairy or scaly, and thus retentive of moisture, and being somewhat delicate in texture, they are usually shy under cultivation. A shady situation suits them best, and they should have very little water sprinkled on the fronds at any time, and none during winter, the soil being then kept moderately dry. They are distinguished from other genera by their inferior, or calyciform, laciniated fimbriate indusium. In one of the species (*W. mollis*), of which the indusium is cup-shaped and nearly entire, there is indeed an approach to the genus Cyathea, (tropical or subtropical tree Ferns), yet to these the Woodsias are not only quite opposed in habit, but are also abundantly distinct in not having, as the Cyatheas have, compressed spore-cases, with an elevated soriferous receptacle. Fig. 60 represents a frond of *W. hyperborea* (full size), with a magnified pinna shewing the position of the sori and venation.

1. W. hyperborea, R. Brown (Polypodium, Swartz; W. alpina, Newman).—A dwarf hardy or frame species, indigenous to Britain, found sparingly in the north of Europe and North America. Fronds narrow lanceolate, pinnate, two to six inches long, dullish green, with a few narrow scales beneath; pinnæ triangular, pinnatifid, slightly cordate at the base, with rounded very obtuse segments. Sori medial, at first distinct, subsequently confluent. Indusium deeply laciniated, terminating in capillary articulated segments. Stipes with an articulation near the middle, the upper part falling away when mature, and the basal portion remaining adherent to a somewhat tufted rhizome.

2. W. ilvensis, R. Brown (Polypodium, Swartz).—A low growing hardy or frame species, indigenous to Britain, and found in Germany, Italy, and the most northern parts of the northern hemisphere as far as Greenland. Fronds lanceolate, pinnate, palish green, three to six inches long, covered with hairy or narrow chaffy scales especially beneath; pinnæ oblong, deeply pinnatifid, with oblong-obtuse or bluntly ovate sometimes crenated lobes. Sori sub-terminal. Indusium deeply

laciniated, terminating in jointed hairs. Stipes articulated at some distance from the rhizome, which is slightly tufted. These two native species are plants of no particular beauty, but are prized as rarities among collections of cultivated Ferns.

3. W. mollis, J. Smith (Physematium molle, Kaulfuss).—An ornamental half hardy or greenhouse deciduous Fern, from Mexico. Fronds hairy, lanceolate, one to one and a half foot long, bipinnate; pinnæ oblong-lanceolate, rather obtuse; pinnules oblong, sessile, round at the apex and crenate at the margin. Sori sub-terminal, with 2-3 spore-cases in each sorus. Indusium cup-shaped, fringed on the margin, and scattered over with glandulose hairs. Fronds terminal, adherent to a somewhat tufted rhizome.

4. W. obtusa, Hooker (Aspidium, Willdenow; W. Perriniana, Hooker et Greville).—A hardy or half-hardy deciduous Fern, from North America. Fronds lanceolate, about a foot long, sub-tripinnate, yellowish green, and covered beneath with glandulose hairs; pinnæ triangularly-elongate; pinnules oblong, round at the apex, crenately cut at the margin. Sori terminal. Indusium deeply laciniated, with fringed segments. Fronds terminal, adherent to a somewhat tufted rhizome.

MYSTOPTERIS, Bernhardi.—Name derived from kystos, a bladder, and pteris, a fern; alluding to the inflated indusia.

Sori round, very small, medial, often becoming confluent. Indusium lateral, oblong, semi-calyciform, inflated, cucullate, attached across the vein by its broad base beneath the sori, becoming reflected, its free margin or apex dentate or fimbriate, and directed towards the apex of the segment. Veins forked; venules simple, free. Fronds glabrous, slender, from a few inches to a foot or more long. Rhizome tufted or creeping.—The few species of this genus are of a very delicate texture; they are hardy or half-hardy deciduous species, admirably adapted for cultivating on artificial rockwork, or for enlivening old walls or ruins during summer; but the fronds being fragile, and very tender, are destroyed by the first frosts in autumn. They have a very extensive geogra-





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phical range, being found in the East and West Indies, North and South America, the Islands of the Pacific Ocean, and throughout Europe. Their nearest affinity is with Woodsia, from which genus they are distinguished by their semi-calyciform indusium. Fig. 61 represents a pinna of C.

tenuis (nat. size), with a magnified pinnule shewing the position of the sori and venation.

1. C. fragilis, Bernhardi (Aspidium, Swartz).-A very brittle, neat, deciduous, hardy Fern, indigenous to Britain, and found throughout Europe, and in the Canary Islands, Northern India, the Cape of Good Hope, and North and South America. Fronds lanceolate, bipinnate, six inches to a foot long, of a lively green; pinnæ oblong or ovate-lanceolate; pinnules ovate or ovate-lanceolate, deeply pinnatifid, with dentate segments. Sori distinct in an early stage, subsequently confluent. Fronds terminal, adherent to a short creeping rhizome. This species varies considerably even in the outline of its fronds, some are lanceolate and others triangularly elongate; some of the forms are perhaps distinguishable, although often connected by intermediate states.

C. fragilis B. angustata. Fronds lanceolate-acuminate, bipinnate; eight to twelve inches long; pinnæ taper-pointed; pinnules ovate or linear lanceolate, deeply pinnatifid with toothed segments, or simply

toothed. Sori scattered.

2. C. dentata, Hooker (Aspidium, Swartz; Cystea, Smith) .- A neat dwarf hardy deciduous Fern, native in Britain, and probably elsewhere. Fronds ovate-lanceolate, six to eight inches long, bipinnate, lively green; pinnæ lanceolate; pinnules ovate-obtuse, rarely pinnatifid, bluntly and unequally toothed. Sori distinct, and

near the margins. Fronds terminal, adherent to a short creeping rhizome.



3. C. Dickieana, Sim .- A very neat dwarf hardy deciduous Fern, found originally in a cave near the sea, at Aberdeen, by Dr. Dickie. Frond ovate-lanceolate, bipinnate, six inches long, of a grass green; pinnæ rather ovate, overlapping, deflexed; pinnules oblong-ovate, obtuse, somewhat crowded, pinnatifid, and very slightly toothed. Sori distinct, near the margins. Rachis winged. Stipes scaly at the base; terminal, adherent to a tufted rhizome. We place this and the last doubtingly as species, though they appear distinct; C. Dickicana is certainly one of the most distinct-looking of the whole genus, and comes true from the spores. Both have been considered varieties of C. fragilis. Perhaps C. Dickieana and C. dentata are the extreme forms of a species distinct from C. fragilis.

4. C. bulbifera, Bernhardi (Aspidium, Swartz).—A bulb-bearing hardy deciduous Fern from North America. Fronds lanceolate-elongate, bipinnate, one to one and a half foot long, palish green; pinnæ lanceolate; pinnules ovate-oblong, deeply pinnatifid, with dentate segments. The fronds of this species bear bulbs near the apex, and usually one or two on the under surface of each pinna; these fall away very readily, and produce young plants.

Fronds terminal, adherent to a tufted rhizome.

5. C. alpina, Desvaux (C. regia, Presl.; Aspidium regium and alpinum, Swartz).—A very neat dwarf-growing hardy or frame species, indigenous to Britain, and found in the East and West Indies, North and South America, and the southern part of the Alps. Fronds lanceolate, sub-tripinnate, six or eight inches long, light green; pinnules ovate-oblong, confluent, deeply pinnatifid, with broadly and shortly linear obtuse segments, having two or three erect blunt teeth. Fronds terminal, adherent to a tufted rhizome.

6. C. tenuis, Schott (Aspidium, Swartz; C. atomarium, Willdenow) .- A half hardy deciduous Fern, from North America. Fronds oblong-lanceolate, sub-tripinnate, twelve to fifteen inches long, light green; pinnules oblong, rather ovate, largest next the rachis, deeply pinnatifid, with blunt dentate segments. Fronds lateral or terminal,

adherent to a creeping rhizome.

7. C. montana, Link (Aspidium, Swartz) .- A very elegant hardy or frame species, indigenous to Britain, found also in the north part of the Alps, and in the rocky mountains of North America. Fronds triangular, sub-tripartite, tripinnatifid, nearly a foot long, lively green; pinne spreading; pinnules oblong-obtuse, with inciso-dentate blunt segments. Sori confluent. Fronds lateral or terminal, adherent to a slender creeping rhizome.

ASTREA, Prest (Aspidii sp. Swartz; Nephrodii sp. of Authors) .- Name commemorative of M. Delastre of 1 Chatellerault, a French botanist, and an excellent microscopical observer.

Sori round, uniscrial, medial or terminal. Indusium reniform, lateral, rarely orbicular, glabrous or pilose, sometimes cochleate. Veins forked or pinnate; venules direct, free. Fronds pinnate, bi-tri-pinnate, or decompound, from one to five feet long, glabrous, pilose, or glandulose. -The name given to this genus was originally applied by Bory de St. Vincent, to a sectional group of the Polypodiums, which included Occopteris, Thelypteris, and some other British species; and it has been subsequently adopted by Presl, and others, for an extensive group of the Aspidieae, including those just named, having forked or pinnate free veins, and reniform indusia. In its present form, Lastrea contains the greatest number of species of any genus of Aspidicae, and the species vary considerably in size, habit, and circumscription of frond. The close affinity of some of them with

Fig. 62

other genera, renders it exceedingly difficult to construct clear distinctive generic characters; forked free veins and reniform indusia, the most obvious marks of Lastrea, being common to Nephrolepis and Oleandra, and are likewise found in Polystichum. It is therefore necessary to point out that habit is combined with the above-mentioned characters, to furnish technical marks by which the Lastreas may be recognised. Fig. 62 represents a pinna of L. murginalis

1. L. decurrens, J. Smith (Polypodium decursive-pinnatum of gardens).—A half hardy or greenhouse deciduous Fern, from China. Fronds lanceolate, pinnate, a foot or more long, palish green; pinnæ sessile, pinnatifid, decurrent and lobed, forming a sinuose wing to the rachis, lower ones small and entire. Sori terminal, or sub-terminal. Indusium small, soon becoming obsolete. Stipes and rachis paleaceous; terminal, adherent to a decumbent somewhat tufted rhizome.

2. L. Oreopteris, Presl (Aspidium, Swartz). - A fragrant deciduous hardy species, indigenous to Britain and found throughout Europe. Fronds lanceolate, glabrous above, glandulose beneath, pinnate, one to two feet long, yellowish green; pinnæ lanceolate, sessile, deeply pinnatifid, with oblong-obtuse entire flat segments, largest next the rachis. Sori sub-marginal. Indusium small, indistinct glandulose. Stipes very short, covered with pale brown scales, some of which are also scattered on the rachis. Fronds terminal, adherent to a thick, somewhat tufted scaly rhizome.

3. L. contermina, Presl (Aspidium, Willdenow).-An ornamental evergreen warm greenhouse species, a native of the West Indies and many parts of Tropical America. Fronds lanceolate, one to one and half foot long, yellowish green, pinnate; pinnæ lanceolate, sessile, rather hairy, glandulose beneath, deeply pinnatifid, with oblong-obtuse segments, largest next the rachis. Sori sub-marginal. Indusium hairy. Fronds terminal, adherent to a somewhat creeping rhizome.

4. L. Kaulfussii, Presl (Aspidium, Link).—An evergreen stove Fern, from Brazil? Fronds pubescent, lanceolate, one to one and half foot long, dull green, pinnate; pinnæ lanceolate, sessile, deeply pinnatifid, with oblong obtuse segments. Sori sub-marginal. Indusium very hairy. Stipes with a few scattered scales. Fronds terminal, adherent to an erect rhizome.

5. L. noveboracensis, Presl (Aspidium, Swartz). - A rather dwarf growing hardy deciduous Fern, from North America. Fronds hairy, lanceolate, about a

foot high, very slender, rather membranous, light green, pinnate; pinnæ lanceolate, sessile, deeply pinnatifid, with linear oblong obtuse segments, largest next the rachis. Sori medial. Fronds terminal, adherent to a slender

 L. patens, Presl (Aspidium, Swartz; A. molle, Link).—An ornamental evergreen stove species, from the West Indies. Fronds broadly lanceolate, pinnate, pubescent and glandulose beneath, three to five feet long, light green; pinnæ sessile, lanceolate, deeply pinnatifid, with linear oblong sub-falcate segments, acute at the apex and largest next to the rachis. Sori medial. Indusium glandulose, and very hairy. Stipes with large scales at the base. Fronds terminal, adherent to an erect caudex, often a foot or more high.

7. L. augescens, J. H. (Aspidium, Link; Nephrodium Ottonis, of gardens).—An evergreen stove Fern, from Cuba. Fronds slender, semi-erect, pubescent, broadly lanceolate, three to four feet long, palish green, pinnate; pinnæ narrow linear-lanceolate, sessile, pinnatifid, with oblong rather obtuse small rigid segments, largest next the rachis. Sori medial. Indusium hairy. Fronds lateral, or terminal, adherent to a creeping rhizome.

8. L. invisa, Presl (Aspidium, Swartz).—An evergreen stove species, from Jamaica. Fronds lanceolate, minutely pubescent beneath, pinnate, four to six feet long, pale green; pinnæ linear-lanceolate, a foot or more long, inferior ones petiolulate, superior sessile, with linear-oblong sub-falcate segments, acute at the apex. Sori medial. Indusium minutely pubescent. Stipes scaly at the base; lateral, adherent to a scaly creeping rhizome.

9. L. Thelypteris, Presl (Aspidium, Swartz; Thelypteris palustris, Schott).-A hardy deciduous Fern, indigenous to Britain, and found throughout Europe, Asia, Africa, and North America. Fronds of two kinds. Fertile fronds erect, rather contracted, lanceolate, pinnate, one and a half to two feet long, rather membranous, pale green; pinnæ lanceolate, deeply pinnatifid, inferior ones petiolulate, superior sessile, segments oblong with revolute edges. Sori medial. Indusium terminating on the free margin, with glandulose hairs. Sterile frond pinnate, one to one and a half foot long; pinnæ lanceolate, deeply pinnatifid, with oblong flat segments. Fronds glabrous; lateral, adherent to a slender creeping rhizome.

10. L. vestita, J. Smith (Polypodium, Raddi).-A beautiful evergreen stove Fern, from Brazil. Frond ovatelanceolate, pinnate, one and a half to two feet long, pubescent; pinnæ lanceolate, deeply pinnatifid, inferior ones petiolulate, segments linear-oblong, repand, and acute at the apex. Sori medial. Rachis and stipes covered with narrow dark scales. Fronds terminal, adherent to a short somewhat creeping rhizome.

11. L. chrysoloba, Presl (Aspidium, Link).--A beautiful and rather erect growing evergreen stove Fern, from Brazil. Fronds pubescent, triangularly elongate, one to one and a half foot long, pinnate, bipinnate below, dull

green; pinnæ lanceolate, sub-falcate, petiolulate, deeply pinnatifid, with oblong rather obtuse repand segments, lower ones lobed. Sori medial. Stipes and rachis scattered over with small scales. Fronds terminal, adherent to a fasciculate tufted rhizome.

12. L. cristata, Presl (Aspidium, Swartz).—A rather coarse-looking hardy deciduous Fern, indigenous to Britain, found more or less throughout Europe and North America. Fronds linear-lanceolate, pinnate, yellowish green, one and a half to two feet long; pinnæ triangularly elongate, deeply pinnatifid, somewhat cordate at the base, with oblong-ovate obtuse segments, acutely serrate, the lower ones crenately and often deeply lobed. Sori medial. Stipes with few broad scales. Fronds terminal, adherent to a short creeping rhizome.

L. cristata β, uliginosa (L. uliginosa, Newman).—Fronds lanceolate, two feet long, light green, sub-bipinnate; pinnæ triangularly elongate, deeply pinnatifid, segments oblong-ovate, obtuse, inciso-serrate, with mucronate

teeth. Rachis and stipes scaly; terminal, adherent to a short somewhat creeping rhizome.

13. L. lancastriense, J. H. (Aspidium, Sprenget).—A hardy deciduous Fern, from North America. Fronds narrow, lanceolate, pinnate, one to two feet high, yellowish green; pinnæ triangularly elongate, petiolate, deeply pinnatifid, lower ones cordate at the base, with oblong-obtuse dentate segments, largest next the rachis. Stipes scaly, terminal, adherent to a tufted rhizome. This plant appears to be only a form of our indigenous L. cristata.

14. L. Filix-mas, Presl (Aspidium, Swartz; Dryopteris Filix-mas, Schott).—A handsome hardy deciduous Fern indigenous to Britain, and throughout Europe, Asia, Africa, and North America. Fronds broadly lanceolate, sub-bipinnate, deep green, from two to three feet high; pinnæ linear-lanceolate; pinnules oblong-obtuse, the basal ones more or less distinct, upper ones confluent, crenato-serrate on the margin. Sori medial. Fronds terminal, adherent to a short tufted rhizome, forming large scaly crowns. Of this, one of the commonest of our native Ferns, there are two or three rather interesting varieties.

L. Filix-mas β, incisa.—A robust growing variety. Fronds lanceolate-bipinnate, three to four feet long;

pinnules elongate, narrowed to the apex, inciso-serrate, the lobes rather sharply toothed.

L. Filix-mas  $\gamma$ , cristata.—This is one of the most beautiful Ferns in cultivation. Fronds ovate or oblong-lanceolate, about two feet long, semi-erect, bright green; pinnæ narrow-elongate, pinnatifid. The apex of the frond, and also that of every pinna, expands into a compact tasselled tuft, similar to that produced by the multifid variety of Scolopendrium vulgare. Sori confined to the upper half of the frond. Rachis and stipes covered with brown chaffy scales. Fronds terminal, adherent to a tufted rhizome. This very elegant Fern, which has been known but a few years, is exceedingly rare in cultivation. It was found in Cornwall.

15. L. Goldiana, Presl (Aspidium, Hooker; Nephrodium, Hooker et Greville).—A hardy deciduous Fern, from North America. Fronds broadly lanceolate, one and a half to two feet high, yellowish green, sub-bipinnate; pinnæ broadly-lanceolate, deeply pinnatifid; pinnules linear oblong, rather obtuse at the apex, basal ones distant, upper ones confluent, crenate, serrate, or slightly lobed on the margin. Sori medial. Stipes and rachis scaly-Fronds terminal, adherent round the crown of a tufted rhizome.

16. L. marginalis, Presl (Aspidium, Swartz).—A very handsome hardy Fern, from North America. Fronds lanceolate, bipinnate, one and a half to two feet long, bluish green; pinnæ oblong-acuminate; pinnules oblong-ovate, obtuse, largest next the rachis, and crenate on the margin. Sori marginal. Rachis and stipes paleaceous. Fronds terminal, adherent to a tufted rhizome, forming large crowns.

17. L. acuminata, J. H.—An evergreen warm greenhouse Fern, the native country of which is doubtful; probably from Nepal. Frond glabrous, triangularly elongate, bipinnate, a foot or more long, dull green; pinnæ triangularly elongate-acuminate; pinnules oblong-ovate, lower ones entire, and slightly pinnatifid, upper ones decurrent at the base, and rather rigidly toothed. Sori medial. Stipes scaly at the base; terminal, adherent to a somewhat tufted rhizome.

18. L. eburnea, J. Smith (Aspidium, Wallich; Polypodium oxyphyllum, Wallich).—A rather rigid evergreen stove Fern, from Nepal. Fronds glabrous, broadly lanceolate, bipinnate, one and a half foot long, very dull green; pinnæ triangularly elongate; pinnules oblong-acute, pinnatifid, lower ones entire, upper confluent, with rather rigid dentate or bidentate segments. Sori medial. Indusium very small, and soon obliterated by the swelling sori. Rachis and stipes of a brownish red, with scales at the base; terminal, adherent to a sealy erceping rhizome.

19. L. rigida, Presl (Aspidium, Swartz).—A neat hardy deciduous Fern, indigenous to Britain, said to be found also in various parts of Europe and Siberia. Fronds glandulose, narrow-lanceolate, bipinnate, one to one and a half foot long, deepish green; pinnules oblong-linear, obtuse, slightly pinnatifid, with rounded broad segments, dentate, without spinulose points to the teeth. Sori medial; indusium fringed with stalked glands. Rachis and stipes chaffy; terminal, adherent to a tufted rhizome.

20. L. elongata, Presl (Aspidium, Swartz).—An ornamental, evergreen, warm greenhouse species, a native of the Canary Islands, Madeira, Azores, &c. Fronds glabrous, triangularly elongate, two to three feet long, deep green, sub-tripinnate; pinnæ triangularly elongate, especially below; pinnules oblong-acute, or obtuse, with slightly dentate blunt segments. Sori medial. Stipes paleaceous; terminal, adherent to a thick short creeping rhizome.

21. L. spinulosa, Presl (Aspidium, Swartz; not A. spinulosum, Willdenow; L. spinosa, Newman).—An elegant hardy deciduous Fern, indigenous to Britain, and dispersed over the whole of Europe. Frends erect, narrow ovate-lanceolate, the margins nearly parallel below, glabrous, bipinnate, one to three feet high, pale yellowish

19.1

green; pinnules oblong, inciso-pinnatifid, with serrate spinose mucronate lobes. Sori medial. Indusium entire on the margin. Stipes with broad ovate pale-coloured scales, approximate near the base, remote upwards; terminal, adherent to a somewhat tufted rhizome. This is closely related to *L. cristata*, through the *L. uliginosa*, Newman, our *L. cristata*, **B.** A form of the next species is often mistaken for it.

22. L. dilatata, Presl (Aspidium, Willdenow; A. spinulosum, Willdenow; L. multiflora, Newman).—A very elegant hardy deciduous species, indigenous to Britain, and found in various parts of Europe. Fronds ovate-lanceolate, arched, glabrous, bipinnate, often tripinnate below, from one to three feet high, deep green; pinnules pinnatifid or pinnate, with serrated spinose-mucronate lobes. Sori medial. Indusium fringed with stalked glands. Stipes densely scaly, the scales lanceolate, entire, and usually dark-coloured down the centre; terminal, adherent to a tufted rhizome. There are numerous forms of this species.

23. L. intermedia, Presl (Aspidium, Willdenow).—An ornamental, hardy, deciduous Fern, from North America. Fronds rather ovate-acuminate, two feet high, light green, bipinnate; pinnules narrow oblong-acute, lower ones pinnatifid, upper confluent, segments inciso-serrate, with spinulose teeth. Fronds terminal, adherent to a tufted

rhizome. This is probably only an occidental form of our indigenous L. dilatata.

24. L. fænisecii, Watson (Nephrodium, Lowe; L. recurva, Newman).—A beautiful, compact, evergreen, hardy Fern, indigenous to Britain, and also found in Madeira, &c. Fronds deltoid, glandulose beneath, sub-tripinnate, one to one and a half foot long, lively green; pinnules oblong, curved upwards, deeply pinnatifid, with serrated spinose-mucronate recurved lobes. Sori medial. Indusium jagged at the margin, with minute sessile glands. Rachis and stipes clothed with narrow jagged scales; terminal, adherent to a tufted rhizome. This plant has been long cultivated under the name of Aspidium dumetorum, but is not the A. dumetorum of Sir J. E. Smith's own herbarium, which is a mere dwarf form of L. dilatata.

25. L. glabella, J. Smith (Nephrodium, A. Cunningham).—An evergreen, warm greenhouse Fern, from New Zealand. Fronds glabrous, triangularly elongate, about a foot long, sub-tripinnate, lightish green; pinnæ triangularly elongate; pinnules oblong-linear, pinnatifid, basal ones entire, upper ones confluent, with dentate segments. Sori medial. Stipes with a few scales at the base; terminal, adherent to a tufted rhizome.

26. L. pubescens, Presl (Aspidium, Swartz).—A rather dwarf-growing, evergreen stove Fern, from Jamaica. Fronds pubescent, deltoid, about a foot long, sub-tripinnate, whitish green; pinnules oblong-linear, with sharply dentate segments, largest on the superior side. Sori medial. Stipes covered with brown scales, especially at the

base; lateral, adherent to a slender scaly creeping rhizome.

27. L. decomposita, J. Smith (Nephrodium, R. Brown).—An ornamental, evergreen, warm greenhouse Fern, from New Holland. Fronds rather membranous, deltoid, one and a half to two feet long, tripinnate, light green; pinnules oblong, acute or obtuse, inciso-pinnatifid, with dentate segments. Rachis and midrib of pinnæ pubescent; Stipes scattered over with small dark scales. Sori medial. Fronds lateral, adherent to a creeping rhizome, about the size of a goose-quill.

28. L. elegans, Hort.—A very handsome, evergreen stove species, from Ceylon. Fronds deltoid, glandulose, densely pubescent, one and a half to two feet high, rather erect, tripinnate, light green; pinnules oblong-linear, acute, decurrent at the base, deeply pinnatifid, with short dentate segments. Sori sub-marginal. Indusium often peltate. Stipes scaly at the base; lateral, adherent to a creeping rhizome. This is a rare species in cultivation. Introduced to Kew, about six years ago, by the late Dr. Gardner.

29. L. spinescens, J. H.—An ornamental, evergreen stove Fern, from the East Indies. Fronds pubescent, deltoid, one and a half to two feet long, dull green, tripinnate; pinnules linear-lanceolate, pinnatifid, decurrent at the base, with rather ovate slightly dentate segments, terminating in a long spinous mucro. Sori sub-marginal. Stipes scaly. Fronds lateral, adherent to a scaly creeping rhizome. This species is also rare in cultivation, although introduced ten years ago, among some Orchids, by S. Rucker, Esq., of Wandsworth.

30. L. hispidum, J. H. (Aspidium, Swartz; Polystichum, J. Smith).—A very hairy, evergreen, warm greenhouse Fern, from New Zealand. Fronds hairy, deltoid, a foot long, dark green, tripinnate; pinnules linear-lanceolate, narrow, pinnatifid, with narrow mucronate segments. Sori medial. Fronds terminal, adherent to a creeping rhizome.

31. L. villosa, Presl (Aspidium, Swartz).—A robust-growing, evergreen stove species, from Jamaica. Fronds hairy, triangularly elongate, ten to twelve feet long, light green, tri-quadri-pinnate; pinnules oblong-linear, rather obtuse, deeply pinnatifid, with oblong segments round at the apex. Sori medial. Indusium glandulose. Rachis and stipes densely covered with narrow fringed scales. Fronds terminal, adherent to an arborescent caudex.

OLYSTICHUM, Schott: Roth. (Aspidii, sp. of Swartz).—Name derived from polys, many, and stichos, order; alluding to the numerous regular lines in which the sori are disposed.

Sori round, uniserial, medial, rarely terminal. Indusium orbicular, central, rarely excentric and reniform. Veins forked, or pinnately forked; venules direct, free, the lower exterior one or more fertile. Fronds glabrous or squamose, simple pinnate or bi-tri-pinnate, with coriaceous pinnæ, usually auriculate at the base on the superior side and serrate on the margin, the teeth or serratures terminating in a rigid mucro or spinule.—This genus and the preceding are so closely allied, that it becomes difficult to find characters whereby they may clearly be distinguished; indeed, the characteristics which have been proposed by various authors for their definition are, to a great extent, as applicable to one as the other. The reniform indusia and free veins which characterize

Lastrea, and the very rigid or coriaceous spinous habit so prevalent among the Polystichums are sometimes present in the same frond, and can therefore hardly be considered as affording discriminative characters. Indeed it is found that, although habit may in some cases assist in the definition of generic groups, yet in others it becomes of secondary importance. With the exceptions of P. rhizophyllum, coniifolium, and aristatum, species which cannot well be omitted,—the former differing in having no spiny teeth to the pinnæ, and in their not being auriculate, and the two latter in having reniform indusia,—the whole of the species enumerated below have the common characters of round sori with a peltate indusium, and coriaceous spinulose fronds, together with a great uniformity

of aspect and habit. Fig. 63 represents a small portion of a frond of *P. capensis* (nat. size).

1. P. rhizophyllum, Presl (Aspidium, Swartz).—A dwarf evergreen stove species, from Jamaica. Fronds pubescent, lanceolate, pinnate, eight or ten inches long, light green; pinnæ roundish ovate, petiolate, sub-crenate at the margin, confluent at the apex, elongated, and rooting at the point. Stipes short, scaly; terminal, adherent to a tufted rhizome.

2. P. falcinellum, Presl (Aspidium, Swartz; A. auriculatum, of gardens). — An ornamental evergreen warm greenhouse Fern, from Madeira. Fronds oblong-lanceolate, pinnate, one to one and a half foot long, bright green; pinnæ linear-oblong, acute, petiolate, auriculate on the superior base, inferior obliquely truncate, the margin doubly-serrate. Rachis and stipes scaly; terminal, adherent to a fasciculate tufted rhizome.

3. P. acrostichoides, Schott (Aspidium, Swartz).—A hardy evergreen species, from North America. Fronds lanceolate, pinnate, dull green, two feet high, contracted on the apex, where it is soriferous; pinnæ oblong-linear-acute, petiolate, upper base auriculate, lower obliquely truncate, the margin ciliato-serrate, with long spinulose hairs. Sori confluent. Rachis and stipes scaly; terminal, adherent to a tufted rhizome.

4. P. Lonchitis, Roth. — A hardy evergreen Fern, indigenous to Britain, and found in various other parts of Europe. Fronds rigid, linear-lanceolate, pinnate, deep green, a foot or more high; pinnæ short, crowded, acute, sub-imbricate, falcate, acutely auricled on the upper base, lower cuneate, the margin ciliate-serrate, with spiny teeth. Rachis and stipes chaffy; terminal, adherent to a tufted rhizome.

5. P. nucronatum, Presl (Aspidium, Swartz).—A rather close-growing evergreen stove species, from Jamaica. Fronds linear-lanceolate, pinnate, a foot or more long, deep green; pinnæ petiolate, oblong-ovate, mucronate, lower ones sub-hastate, auriculate on the superior base, inferior obliquely cuneate, the margin serrate, with long spiny teeth. Rachis and stipes chaffy; terminal, adherent to a tufted rhizome.

6. P. aculeatum, Roth (Aspidium, Swartz).—A hardy evergreen Fern, indigenous to Britain, and found almost all over Europe, in Asia, Africa, and North America. Fronds broadly lanceolate, bipinnate, dark green, two feet high; pinnules rigid, attached by their wedge-shaped base, ovate,

acute, sub-lunate, aristate, auriculate at the base on the upper side, obliquely truncate on the lower, the margin spinulose-serrate; the one next the rachis is usually larger than the rest. Sori copious on the upper half of the frond. Rachis and stipes densely covered with large brown scales; terminal, adherent to a tufted rhizome.

Fig. 63.

P. aculeatum B. oblusum.—Fronds lanceolate, bipinnate, a foot and a half long, dark green, thick, but not rigid in texture; pinnules oblong obtuse, terminated by an aristate tooth, broadly wedge-shaped at the base, and somewhat auricled, the margin crenate-serrate, with spinulose teeth. Rachis and stipes chaffy; terminal, adherent to a tufted rhizome.

P. aculeatum \( \gamma\) lobatum (P. lobatum, Prest).—Fronds narrow lanceolate, sub-bipinnate, dark green, very rigid, one to one and a half foot long; pinnules convex, ovate-acuminate, obliquely decurrent and cuneate at the base, with more or less prickly spinulose teeth on the margin; the one next the rachis on the upper side much larger than the rest. Rachis and stipes chaffy; terminal, adherent to a tufted rhizome. This form is widely distributed, and insensibly connected with the typical plant. In its ordinary state, it is narrower and less divided.

7. P. angulare, Presl (Aspidium, Kitaihel: Willdenow).—A hardy evergreen Fern, indigenous to Britain, and found also in Hungary. Fronds lax, drooping, broadly lanceolate, bipinnate, lightish green, about two feet long, pinnules ovate, obtuse, rather membranous, aristate, petiolate, and blunt angled at the base, with a large auriele on the upper side, spinulose serrate on the margin. The pinnules vary from ovate obtuse with a serrate margin, to ovate lanceolate with the margin deeply pinnatifid. Rachis and stipes very chaffy; terminal, adherent to a tufted rhizome.

8. P. pungens, Presl (Aspidium, Kaulfuss).—An ornamental evergreen warm greenhouse Fern, from the Cape

of Good Hope. Fronds ovate lanceolate, bipinnate, one and a half to two feet long, light green; pinnules trapeziooblong, sub-falcate, petiolate, upper base auriculate, lower truncate-cuneate, deeply serrate, with spinulose teeth on the margin. Rachis and stipes scaly; terminal, adherent to a short creeping rhizome.

9. P. vestitum, Presl (Aspidium, Swartz).—A rigid evergreen greenhouse Fern, from New Zealand. Fronds somewhat lanceolate, a foot or more long, bipinnate; pinnæ oblong-acute; pinnules rather ovate, slightly auriculate, cuneate at the base, only one or two pair distinct, the rest confluent with a sharp mucronate tooth on the apex. Rachis and stipes thickly clothed with narrow scales. Fronds terminal, adherent to a tufted rhizome. This Fern is very similar to P. proliferum, but is more rigid, and not viviparous at the apex.

10. P. proliferum, Presl (Aspidium, R. Brown).—A proliferous evergreen warm greenhouse Fern, from Van Diemen's Land. Fronds linear lanceolate, one and a half to two feet long, bipinnate, dull green, and proliferous on the apex; pinnules oblong-ovate, obtuse, sub-falcate, petiolulate, slightly auriculate on the superior base, obliquely truncate-cuneate below, and bluntly dentate on the margin. Rachis and stipes paleaceous; terminal, adherent to a thick tufted rhizome.

11? P. drepanum,\* Presl (Aspidium, Swartz).—An ornamental evergreen warm greenhouse species, from Madeira. Fronds rather ovate-acuminate, one and a half to two feet long, dark green, bipinnate; pinnæ 4-6 inches long; pinnules lanceolate-falcate, auriculate, pinnatifid, inferior ones distant, cuneate at the base, superior ones confluent, that next the rachis on the upper side longest, the segments all acutely toothed. Rachis and stipes paleacous; terminal, adherent to a fasciculated erect rhizome.

12. P. æmulum, Presl (Aspidium, Swartz; A. lætevirens of gardens).—A robust growing evergreen warm greenhouse Fern, from Madeira. Fronds deltoid, tripinnate, two and a half or three feet high, bright green; pinnules oblong-lanceolate-acute, pinnatifid, with serrate-mucronate, rather ovate segments. Fronds terminal, adherent to a scaly creeping rhizome. Stipes densely scaly, with a few scales scattered on the rachis.

13. P. capense, J. Smith (Aspidium, Swartz; A. coriaceum of gardens).— A large growing evergreen warm greenhouse Fern, from the Cape of Good Hope. Fronds glabrous, deltoid, tripinnate, deep green, two and a half to three and a half feet long; pinnules oblong-lanceolate-acute, pinnatifid, cuneate at the base, with obtuse dentate segments. Sori large. Indusium deciduous. Fronds lateral, adherent to a decumbent, thick, densely scaly, cæspitose rhizome.

14. P. coniifolium, Presl (Aspidium, Wallich).—A rough-looking evergreen stove species, a native of Ceylon, the East Indies, and the Philippine Islands. Fronds deltoid, tri-quadripinnate, two and a half feet high, dark green; pinnules oblong-ovate, acute, pinnatifid, cuneate at the base, with spinose-mucronate teeth on the margin. Sori copious throughout the whole frond. Indusium reniform. Fronds lateral, adherent to a small creeping rhizome.

15. P. aristatum, Presl (Aspidium, Swartz).—A rigid evergreen warm greenhouse Fern, from New Zealand and Norfolk Island. Fronds deltoid, bi-tri-pinnate, one and a half foot long, bright green; pinnules sub-rhomboidal or oblong-obtuse, pinnatifid, with mucronate dentate segments, largest next the rachis. Stipes scaly at the base. Fronds lateral, or terminal, adherent to a creeping rhizome. This species is very similar to P. coniifolium, but is a dwarfer growing plant, more rigid, with the fronds more compact and leafy, the spore-cases being terminal and the indusium reniform.

MYCLOPELTIS, J. Smith.—Name derived from kyklos, a circle, and pelte, a small buckler, alluding to the indusium.

Sori round, biserial medial or terminal. Indusium orbicular, peltate. Veins dichotomously branched; venules direct, free, the anterior and exterior one of each fascicle soriferous.—The species on which this genus was founded, was formerly associated with Lastrea, but its round sori and large peltate indusium, similar to Polystichum, are quite at variance with that genus. Its glabrous pinnæ articulated with the rachis, bring it near to Nephrolepis, from which it is readily known by its habit and by its having a peltate indusium and round sori. Fig. 64 represents a pinna of *C. semicordata* (nat. size).

1. C. semicordata, J. Smith (Aspidium, Swartz; Lastrea, Prest). — An ornamental shining evergreen stove Fern, from Jamaica and other West Indian Islands. Fronds lanceolate, pinnate, bright shining green, two to three feet long; pinnæ glabrous, falcate lanceolate, sessile, 4-5 inches long, irregularly cordate or auriculate at the base, and articulated

This species is not very commonly cultivated, although it has been frequently introduced. There appears to be some doubt as to its nomenclature. We are assured by the Rev. W. W. Spicer—a gentleman possessing both a scientific and practical knowledge of Ferns, and who has imported it from Madeira, and cultivated it for several years—that it is destitute of an indusium, and consequently is a true Polypodium, although possessing the habit and aspect of a Polystichum. Mr. Henderson, of Wentworth, also informs us, that he has examined the fronds in all stages of growth, without being able to discern any trace of indusium; and we can state the same, both with reference to fresh fronds kindly forwarded by Mr. Henderson, and our own dried specimens, which, though loaded with fructifications, present no trace of indusium. Nevertheless, Swartz describes it as having an indusium, which he describes as being minute and cordate-subrotund. We have followed Presl in placing it provisionally in Polystichum, in order to afford opportunity for further examination.



Fig 64.

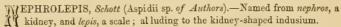
with the rachis, which is pubescent. Sori round, biserial, medial. Indusium peltate. Fronds terminal, adherent to a short thick scaly somewhat tufted rhizome.

DIDYMOCHLENA, Desvaux.—Name derived from didymos, double, and chlaina, a cloak; from the circumstance of the indusium being double.

Sori elliptical, uniserial, situated on the apex of a venule. Indusium oblong, longitudinally attached along the centre. Veins forked, radiating; venules direct, free, the exterior one fertile.—The genus is founded on a solitary species, a native of South America and the Philippine Islands. It is an exceedingly handsome Fern, with an erect arborescent caudex, attaining the height of two feet or more, and having large fronds from three to

five feet long, of a bright shining green. Its very distinct and marked habit readily distinguish it from the other Aspidicæ; and it is easily known by having elliptical sori, and a double centrally attached indusium. Fig. 65 represents the upper part of a pinna of *D. truncatula* (full size).

1. D. truncatula, J. Smith (Aspidium, Swartz; D. sinuosa, Desvaux; D. pulcherrima, Hort.).—A very elegant evergreen stove Fern, from the tropics of South America, the West Indies, and the Philippine Islands. Fronds broadly lanceolate, three to five feet long, bipinnate, bright green; pinnæ linear-lanceolate 8-10 inches long, sessile; pinnules sub-rhomboidal oblong-obtuse, coriaceous, imbricate, truncate-dimidiate at the base, slightly crenulate at the margin, and articulate with the rachis. Stipes, rachis, and midrib of pinnæ, densely clothed with ferruginous tomentum, and long narrow brown scales. Fronds terminal, adherent to an arborescent caudex.



Sori round, transversely uniserial, attached to the apices of the venules. Indusium reniform or sometimes nearly orbicular. Veins forked; venules direct, free, the exterior one soriferous. Fronds pinnate, from two to six feet long, smooth hairy or scaly, with the pinnæ entire, articulate with the rachis, and usually auriculate on the superior base.—One of the features for which Ferns are preeminently esteemed, is the diversity of their foliage, which is elegant, graceful, and attractive, even to an ordinary observer; and although there is little of this diversity among the species belonging to the genus

Nephrolepis, yet they are very elegant plants, and possess some remarkable peculiarities, their rhizome being absolutely without a parallel among cultivated Ferns. The mass of the species

of Ferns are either annual, deciduous, or evergreen fibrous-rooted herbaceous plants, or of arborescent habit; but some of the species of this genus produce tubers at the end of very slender rhizomes, and, during the season of rest, not a vestige of the plant remains, save these subterraneous scaly tubers, which are about the size of a common nut, and from each of which issues a plant in the following spring. The species belonging to Nephrolepis are of uniform habit, and are easily known from all others by their long slender wiry erceping rhizome, by their pinnæ being articulated with the rachis, and by their sori being terminal. Fig. 66 represents a portion of a frond of N. exaltata (nat. size).

Fig. 65.

1. N. pectinata, Schott (Aspidium, Willdenow; A. trapezoides, Schkuhr).

—An evergreen stove Fern, from the West Indies. Frond glabrous, narrow linear-lanceolate, one to two feet long, and one to one and a half inches wide, dark green, pinnate; pinnæ oblong, imbricate, round at the apex, auriculate at the upper base, truncate below, and bluntly dentate on the margin. Fronds terminal, adherent, forming a fascicle on a wiry creeping rhizome.

2. N. undulata, J. Smith (Aspidium, Swartz).—A very elegant deciduous tuberous-rooted stove species, from Sierra Leone. Frond glabrous, narrow lanceolate, one to two feet long, pinnate, lightish green; pinnæ cordato-oblong-acuminate, sub-imbricate, and crenate on the margin. Fronds terminal, adherent, forming a small fascicle on a creeping wiry rhizome. This

species forms tubers beneath the surface of the earth, from which issue the future plants the following spring.

3. N. tuberosa, Presl (Aspidium, Bory).—A tuberous-rooted evergreen stove Fern, from the East Indies and

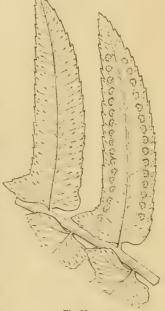


Fig. 66.

China. Fronds slender, narrow linear-lanceolate, one and a half to two feet long, pinnate, deep green; pinnæ cordate-auriculate, oblong, sub-imbricate, round at the apex, crenate or slightly serrate on the margin. Rachis and stipes covered with narrow hair-like scales. Fronds terminal, adherent, forming a fascicle on a slender creeping rhizome. This species bears tubers similar to those of N. undulata; these produce plants, but the fronds do not die down annually.

4. N. exaltata, Schott (Aspidium, Swartz).—An ornamental evergreen stove Fern, a native of the West Indies, South America, New Holland, and the Sandwich Islands. Fronds slender, glabrous, linear-lanceolate elongate, three to six feet long, and two to three inches broad, yellowish green, pinnate; pinnæ sub-cordate oblong-acute, auriculate on the upper side at the base, and serrate on the margin. Rachis and stipes clothed with narrow brown scales. Fronds terminal, adherent in a fascicle to a creeping wiry rhizome.

5. N. platyotis, Kunze.—A robust-growing evergreen stove species, from the East Indies. Fronds lanccolate, pinnate, bright green, three to four feet long, reclining; pinnæ oblong-acute or acuminate, four or five inches long, truncate, auriculate at the base, and crenately-serrate on the margin. Rachis and stipes covered with woolly scales. Sori roundish reniform. Fronds terminal, adherent in a fascicle to a very slender creeping rhizome.

6. N. hirsutula, Presl (Aspidium, Swartz).—A rather erect-growing evergreen stove species, from the Islands of the Pacific. Fronds lanceolate, pinnate, two to three feet long, deep green, and covered throughout with small ferrugineous fimbriate hair-like scales; pinnæ oblong acuminate, three to four inches long, truncate, slightly auriculate at the base, and crenulate-serrate at the margin. Sori situate near the margin. Fronds terminal, adherent in a fascicle to the slender creeping rhizome.

7. N. acuta, Presl (Aspidium, Schkuhr).—A very elegant evergreen stove Fern, from the East Indies. Fronds pubescent, broadly lanceolate, two to three feet long, pinnate, bright green; pinnæ large, oblong-acuminate, four to six inches long, sub-falcate, truncate, auriculate at the base on the superior side, and crenulate on the margin. Fronds terminal, adherent in a fascicle to a wiry creeping rhizome.

LEANDRA, Cavanilles .- The meaning of this name is unexplained.

Sori round, transversely uniserial, costal or irregular. Indusium reniform, rarely orbicular. Veins simple or forked; venules parallel, direct free, with their apices curved, forming a slightly thickened margin. Fronds simple, entire, lanceolate, stipitate, with the stipes articulated near or close to the rhizome, which is frutescent or creeping.—The few species forming this genus are natives of tropical or sub-tropical countries; they have a very distinct habit, are easily cultivated, and some of them are highly ornamental. The characters that

distinguish them from Nephrolepis are their simple fronds with parallel veins, and the spore cases medial or costal. Fig. 67 represents part of a frond of O. nodosa (med. size).

1. O. nodosa, Presl (Aspidium, Willdenow).—A free-growing evergreen stove species, from Jamaica and other West Indian Islands. Fronds lanceolate-acuminate, a foot or more long, bright green, reclining, attenuated at the base, and entire on the margin. Stipes and rachis ebeneous, the latter covered beneath with brown cordate scales. Fronds articulated, with the stipes at some distance from the rhizome, which is scaly and creeping. Sori

2. O hirtella, Miquel.—A very beautiful evergreen stove species, from Java. Fronds hairy, lanceolate, reclining, a foot or more long, very membranous, undulated, light green, round, or slightly attenuated at the base, and entire at the margin. Stipes short and scaly; rachis ebeneous. Fronds verticillate or sub-verticillate, and articulated with a frutescent scaly scandent rhizome. Sori uniserial. This plant is scarce in cultivation; it was introduced to English gardens from the Continent about two years since.

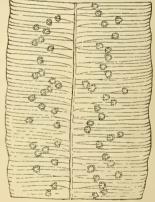


Fig. 67.

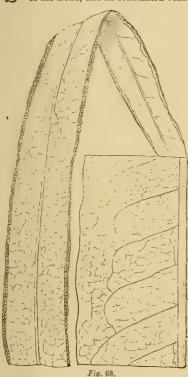
Sub-order-Polypodiaceæ: Tribe-Dicksonieæ.

The primary characteristics of the genera constituting this tribe are:—Sori round, globose, vertically oblong, or transversely elongated, and marginal; the indusiform margin of the frond being changed, and more or less conniving with the special interior-attached lateral indusium, forming a marginal groove, or an urceolate, calyciform, bilabiate, or tubular cyst, containing the spore-cases. The tribe comprises about two hundred described species, among which the most extreme diversity of habit occurs. Some have a wiry cæspitose rhizome, with fronds scarcely exceeding an inch high; and others are among the loftiest of the Fern tribe, having a stout arborescent caudex, attaining the height of twenty or thirty feet, with a crown of fronds on the apex, each frond fifteen or twenty feet long. Their affinity with the Aspidieæ may be traced through Leucostegia, which is scarcely different in the position of its sori and in its indusium from Nephrolepis, or some species of Lastrea; but in habit it best coincides with the Dicksonieæ, which differ from the Aspidieæ by having the sori seated under or on the immediate margin, or projecting beyond the margin, forming fertile crenules. The tribe Dicksonieæ is represented by the genera Lindsæa, Davallia, Trichomanes, Dicksonia, &c., as characterized by Swartz, Willdenow, and others, and presents a group of species widely different in habit, texture of fronds, sori, and indusium. The species may be

naturally divided into four sections, respectively designated by the names of the genera under which many of them originally stood.

SECT. I .- Lindsece, J. Smith.

ICTYOXIPHIUM, Hooker.—Name derived from diktyon, a net, and xiphos, a sword; in allusion to the form of the frond, and its reticulated venation.



Fronds of two kinds: the fertile contracted, with a somewhat revolute margin, soriferous on the upper half. Sori linear, continuous, forming a thick row of spore cases, occupying both margins. Indusium linear, continuous, attached to the sporangiferous receptacle, and opening from the upper surface of the frond, subsequently becoming quite rolled back by the swelling sori. Costa central, ebeneous, prominent. Veins internal, nearly uniform, compoundly anastomosing, with variously directed free veinlets, terminating in the areoles. Fronds simple, entire, linear-lanceolate, two to three feet long, and two to two and a half inches wide. Rhizome fasciculate, erect.—This very rare genus, of which only a solitary species is known, is a native of South America. It was originally discovered in the Isthmus of Panama. The species, which was introduced to Kew about four years since, is rather an erect-growing plant, of distinct habit, the fronds somewhat resembling Drynaria irioides, but the structure of the sori is very remarkable. It is easily recognized from its congeners by a compound anastomosing venation, and by the indusium being attached beneath the sporangiferous receptacle (as in Lindsæa), opening from above, exactly the reverse of Pteris. Fig. 68 represents the upper part of the fertile frond, with a small portion of the sterile one (both nat. size).

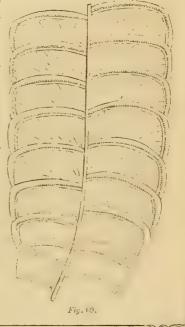
1. D. panamense, Hooker.—A glabrous, and rather erect-growing evergreen stove Fern, from South America. Fronds simple, entire, linear-lanceolate, about two feet long, bright green, coriaceous, attenuated at the base, decurrent on the stipes; which is short, scaly, and terminal, adherent to a fasciculate, erect rhizome.

INDSÆA, Dryander.—Name commemorative of Mr. Lindsey an English botanist, who wrote on the germination of mosses.

Sori linear, continuous, rarely interrupted, produced on a transversely combined sporangiferous receptacle, on the apices of the venules. Special indusium linear, continuous, usually shorter than the indusiform margin. Costa excentric or wanting. Veins forked, radiating; venules (sterile) direct, free. Fronds simple, cordate, pinnate or bipinnate, from six inches to two feet long, with oblong-dimidiate, lunate or flabellate pinnæ, soriferous only on the apex and superior side, the margin usually entire, rarely dentate.—There are but few genera, excepting Adiantum and Trichomanes, whose species can vie with these in elegance. Although abounding in tropical and sub-tropical countries, yet they have, until within a very recent period, been unknown in cultivation, being only found in herbaria. The characters by which they are known from allied genera are, the direct free veins, and unilateral sori. Fig. 69 represents the base of a pinna of L. trapeziforme (nat. size).

1. L. stricta, Dryander.—A very neat-looking evergreen stove Fern, from Trinidad, and various parts of South America. Fronds slender, glabrous, bipinnate, one to two feet high, rather light green; pinnæ linear, narrow-lanceolate, nearly a foot long; pinnules small, oblong-dimidiate, lower ones flabellate, imbricate, round at the apex, upper base truncate, and parallel with the rachis, which is of a rich brown colour. Fronds nearly all fertile throughout; lateral, adherent to a short, rather slender creeping rhizome. This species has been in cultivation since 1848.

2. L. trapeziforme, Dryander —A very elegant evergreen stove species, from French Guiana, and the West and East Indies. Fronds glabrous, bipinnate, one and a half foot long, bright green; pinnæ lanceolate,



petiolate; pinnules flat, lunate, round at the apex, imbricate, lower ones flabellate, truncate at the base, and parallel with the rachis; lateral, adherent to a short creeping rhizome. This beautiful Fern was introduced to Kew in 1845.

SECT. II .- Davallieæ, J. Smith.

Y EUCOSTEGIA, Prest (Davalliæ, sp. of Authors).—Name derived from leukos, white, and stege, a covering; alluding to the pale-coloured indusium.

Sori round, terminal, often solitary on each segment, and seated in the sinus. Indusium orbicular or oblong, attached only by its base, the sides free. Veins forked; venules direct, free. Fronds flabellate-multipartite, or tripinnatifid, with narrow linear-lanceolate or obtuse segments, usually trifid at their apices. Spore-cases vertical.—The leading characteristics of the genera of this section of Dicksonieæ consist in the presence of a special indusium, forming, with the concave indusiform margin, an urceolate, bilabiate, or tubular vertical cyst, and in the spore-cases springing from a simple terminal receptacle. But in the present genus the indusium is of a very different description, being roundish or oblong, attached only by its base, and situated at some distance from the margin of the frond, which is quite flat. The genus thus forms a transition to Nephrolepis, in the tribe Aspidieæ, with which it is somewhat analogous by the position of its sori and indusium; but in habit it coincides with Davallia. Although eight or ten species of Leucostegia are described, only one of them is at present in cultivation. It is very distinct from the other portion of the Dicksonieæ, and is easily known by its scale-like indusium. Fig. 70 represents a pinna of L. immersa (nat. size), with an indusium (magn.).

1. L. immersa, Presl: Wallich. — A slender and very graceful deciduous stove species, from the East Indies. Fronds glabrous, deltoid, one to one and a half foot long, light green, bi-tri-pinnate; pinnæ triangularly elongate, especially below, their apices caudate; pinnules oblong, membranous, deeply pinnatifid, with rather ovate segments, bluntly dentate, or bifid on the apex. Fronds lateral, articulated on a creeping rhizome. This species was imported about two years since by Messrs. Rollisson of Tooting, and has been lately introduced to Kew from Assam.

MICROLEPIA, Presl.—Name derived from mikros, small, and lepis, a scale; alluding to the indusium.

Sori round or oblong, vertical, superficial, intramarginal; receptacle elevated. Spore-cases spreading, rarely immersed in a cystiform cavity. Special indusium attached by its base and sides, widening outwards, with the free margin rounded or truncate. Veins forked or pinnate; venules direct, free. Fronds pinnate or bipin-

nately multifid, one to four feet high, glabrous or villose.—
The distinguishing character of this genus is in the structure of its indusium; and it forms the connecting link between Leucostegia and Davallia. From the former it is distinguished by having the indusium attached by its base and sides, and, from the latter, by not being tubulose. About twenty species are described; but only one of them is at present in cultivation. Fig. 71 represents a pinnule of M. polypodioides (med. size), and a sorus (magn.).

1. M. polypodioides, Presl (Davallia, Don; Dicksonia, Fig. 70. Swartz; Polypodium speluncæ, Linnæus).—An ornamental evergreen stove Fern, very extensively distributed throughout the tropics of the Eastern hemisphere; the plant in cultivation is from Ceylon. Fronds triangularly-elongate, very hairy, three to four feet long, tripinnate, grass green; pinnules oblong acuminate, segments rather membranous, roundish ovate, pinnatifid, decurrent at the base, largest next the rachis, bifid or obtusely crenate on the margin. Fronds lateral, adherent to a creeping rhizome. We are indebted to G. Norman, Esq., of Hull, for cultivated specimens of this Fern; it had been received from the continent.

AVALLIA, Smith.—Name commemorative of Edmund Davall, a Swiss botanist.

Sori vertically oblong, intramarginal; spore-cases pedicellate, attached to the apex of a venule, and exserted beyond the free margin of the indusium, which is usually inflated, forming with the concave indusiform margin a vertical bilabiate or tubular cyst,

with the apex usually constricted. Veins forked, venules direct, free. Fronds of two kinds, sterile and fertile, with the fertile usually contracted, glabrous, or aculeate, from one to four or five feet high, varying from pinnate to decompound, the segments often unisorous. Rhizome frutescent, decumbent, scandent, fasciculate, or creeping.—





\$70/70





The rather numerous species forming this genus are all exceedingly beautiful and not difficult of cultivation. Although distributed abundantly throughout tropical and sub-tropical regions, yet but few of them have been introduced to English gardens until recently, and even now owing chiefly to the indefatigable exertions of some



- of our nurserymen in the importation of exotic Orchids. character that distinguishes them from other genera is the tubulose indusium. Fig. 72 represents a portion of the sterile and fertile frond of D. pyxidata (nat. size), with a magnified fertile segment, shewing the position of the veins, sori, and indusium.
- 1. D. pentaphylla, Blume.-A dwarf-growing evergreen stove Fern, from Java. Fronds glabrous, pinnate, nearly a foot long, bright shining green; pinnæ lanceolate, petiolate, coriaceous, cuneate at the base, and crenate-serrate on the margin. Fronds lateral, articulated with a creeping rhizome, about the size of a goose-quill, which is densely covered with long narrow hair-like scales. Usually there are but two pairs of pinnæ besides the terminal one. This species has been recently introduced by Messrs, Rollisson of Tooting, and Messrs. Veitch of Exeter.
- 2. D. ornata, Wallich.-A very interesting evergreen stove Fern, from Borneo. Fronds glabrous, deltoid, one to one and a half foot long, bright shining green, bipinnate; pinnæ triangularly elongate; pinnules broad, coriaceous, oblong-ovate, fertile lanceolate, inferior triangularly elongate, distant, deeply pinnatifid; superior confluent, cuneate at the base and slightly serrate on the margin. Fronds lateral, articulated with a scandent rhizome, which is densely clothed with woolly scales, especially when young. This species was imported by Messrs. Low, nurserymen, Clapton, about four years since.
- 3. D. solida, Swartz. An ornamental evergreen stove species, native of the East Indies and islands of the Pacific Ocean. Fronds glabrous, deltoid, bi-tri-pinnate, one to one and a half foot long, dark green; pinnules oblong, acute, deeply pinnatifid, largest next the rachis on the upper side, inferior ones cuneate at the base, superior ones confluent, inciso-serrate on the margin. Fronds lateral, articulated with a frutescent scandent rhizome, which is thickly clothed with long narrow brown woolly scales.
- 4. D. nitidula, Kunze.—A glabrous evergreen stove Fern, a native of South Africa. Frond deltoid, bi-tripinnate, a foot or more long, dark green; pinnules triangularly elongate or oblong-ovate, cuneate at the base and dentate at the margin. Fertile frond deltoid, segments very obtuse, and soriferous throughout. creeping. This species is very scarce in cultivation; the only fronds we have seen were cultivated by Messrs. Loddiges, of Hackney.
- 5. D. canariensis, Smith (Polypodium Iusitanicum, Linnaus) .-- A beautiful evergreen warm greenhouse Fern, from the South of Europe, the Canaries, and Madeira. Fronds glabrous, triangular, three-branched, one to one and a half foot long, supradecompound, light green; pinnules oblong, pinnatifid, decurrent at the base, with linear dentate or bidentate segments. Sori solitary. Fronds lateral, articulated with a short thick scaly, somewhat scandent rhizome. The Hare's foot Fern of the gardens.
- 6. D. gibberosa, Swartz.—An evergreen warm greenhouse Fern, a native of the islands of the Pacific Ocean. Fronds glabrous, deltoid, a foot or more long, tripinnate, light green; pinnules oblong pinnatifid, with linear obtuse segments, decurrent at the base. Fronds lateral, articulated with a short scaly creeping rhizome.
- 7. D. pyxidata, Cavanilles.—A deciduous shrubby warm greenhouse Fern, from New Holland. Fronds glabrous, deltoid, tripinnate, one and a half to two feet long, light green; pinnules oblong, pinnatifid, with oblong-obtuse dentate segments, decurrent at the base. Fronds lateral, articulated with a frutescent semi-erect, scaly, slender caudex, attaining the height of three feet or more.
- 8. D. epiphylla, Swartz.—A very elegant evergreen stove species, from the East Indies. Fronds glabrous, triangularly elongate, three to four feet long, tri-quadri-pinnate, bright shining green; pinnæ and pinnules triangularly elongate, sub-caudate, ultimate segments linear-oblong, pinnatifid, decurrent at the base, serrate at the margin. Fronds lateral. Rhizome creeping. This is an exceedingly rare species in cultivation; the only frond we have seen was cultivated in the Horticultural Society's garden at Chiswick.
- 9. D. dissecta, J. Smith MS .- A beautiful evergreen stove Fern, from Java. Fronds slender, glabrous, triangular, tri-quadri-pinnate, one to one and a half foot long, light green; pinnæ triangularly elongate, acuminate; pinnules membranous, oblong, deeply pinnatifid, with linear dentate segments, decurrent at the base. Fronds lateral, articulated with a slender elongated scandent rhizome, densely covered with narrow fimbriate scales. Rachis, midrib of pinnee, and pinnules winged. This species was introduced in 1849, by Messrs. Rollisson of Tooting.

10. D. elata, Swartz.—An exceedingly beautiful evergreen stove Fern, from the East Indies. Frond glabrous deltoid, tri-quadri-pinnate, from three to five feet long, bright shining green; pinnæ and pinnules triangularly elongate-acuminate, segments oblong, pinnatifid, round at the apex, decurrent at the base, the margin slightly crenate-serrate. Fronds nearly all fertile; lateral, articulated with a thick scandent rhizome, which is densely clothed with dark coloured scaly hairs. This elegant Fern was introduced to English collections about five years since from Borneo, by Messrs. Low of Clapton.

11. D. polyantha, Hooker.—An elegant evergreen stove Fern, from the East Indies. Frond glabrous, triangularly elongate, three to four feet long, tri-quadri-pinnate; pinnæ and pinnules triangularly elongate-acuminate, deeply pinnatifid; segments small, oblong-linear, obtuse at the apex, largest on the upper side next the rachis, decurrent at the base, and crenate on the margin. Fronds nearly all fertile; lateral, articulated with a thick decurrent creeping rhizome, densely clothed with soft brown scales. This is the most beautiful species of the genus at present in cultivation; the fronds while young are of a purplish red, subsequently becoming reddish green, and, when mature, bright yellow. It was introduced from Java in 1847, by Messrs. Rollisson of Tooting.

#### SECT. III. Trichomaneæ, J. Smith.

MRICHOMANES, Linnœus.—Name derived from trichos, hair, and mania, excess; alluding to the hair-like receptacles which, in some species, project considerably beyond the indusium.

Sori vertically oblong; spore-cases compressed, terminal, sessile, seated round a columnar receptacle, which is filiform and exserted. Indusium urceolate or ealyciform. Veins simple or forked, direct. Fronds varying from one inch to two feet high, and from simple to decompound; pellucid, glabrous, or furnished with simple, forked, or stellate hairs. Fertile frond sometimes contracted and spiciform. Rhizome cæspitose.—There are no plants throughout the whole vegetable kingdom more intractable under ordinary methods of cultivation, than the species forming the genera Trichomanes and Hymenophyllum, and hence they are very seldom seen in a living state though they are among the most beautiful of all cellular plants. Their texture being very membranous, they

are unable to withstand the influence of a dry atmosphere or the scorching rays of the sun, even for a very short time. In their native localities they are usually found growing in damp caves, on moist rocks, or clinging to the stems of arborescent Ferns, or the trunks of trees, in humid tropical forests; and they can only be successfully cultivated by being kept in a close damp atmosphere, carefully shielded from the rays of the sun. Nearly ninety species of Trichomanes are described, and among them is one indigenous to Ireland. The most obvious characters by which they may be distinguished from other Ferns are: the delicate membranous texture of their fronds; the sessile sporecases, girt by a more or less oblique or transverse ring, and closely seated round a columnar receptacle, formed by the free prolongation of the vein, which is more or less exserted beyond the margin of the indusium. Fig. 73 represents a frond of T. reniforme (nat. size).

1. T. reniforme, Forster.—An elegant evergreen warm greenhouse Fern, from New Zealand. Fronds glabrous, simple, stipitate, about six inches high, shining dark green, reniform, decurrent on the stipes; lateral, adherent to a slender creeping rhizome. Sori contiguous.

2. T. quercifolium, Hooker et Greville.—A very dwarf evergreen stove Fern, from Jamaica. Fronds glabrous, sub-pinnate, about one and a half inch high, light green; segments linear-oblong, and round at the apex. Sori solitary on the upper segments. Fronds lateral, adherent to a creeping rhizome.

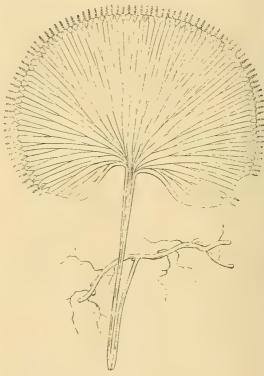


Fig. 73.

3. T. spicatum, R. Hedwig.—A very interesting evergreen stove Fern, from Jamaica. Fronds of two kinds, sterile and fertile. Sterile frond glabrous, simple, oblong, three or four inches long, bright green, deeply pinnatifid, with linear oblong entire segments, round at the apex. Fertile frond contracted, stipitate, simple, erect, five or six inches high, spiciform. Both forms are terminal, adherent to a small fasciculate rhizome. Sori sub-contiguous.

4. T. crispum, Linnæus.—A beautiful evergreen stove species, from Jamaica, Brazil, and other parts of South America. Fronds hairy, sub-pinnate, from six to ten inches long, light green; segments linear oblong, round at the apex, decurrent at the base, forming a winged rachis. Sori on the apex of the segments. Fronds terminal, adherent to a short creeping rhizome. This Fern was introduced to Kew in the early part of 1851 from Jamaica.

5. T. venosum, R. Brown.—A small delicate evergreen warm greenhouse Fern, from New Holland and New Zealand. Fronds glabrous, slender, pinnate, three or four inches long, light green; pinnæ linear, inferior ones petiolate, lobed, or pinnatifid at the base; lateral, adherent to a hair-like creeping rhizome. This species has been in cultivation since 1845.

6. T. radicans, Swartz (T. speciosum, Willdenow; T. brevisetum, R. Brown).—An elegant evergreen, warm greenhouse fern, indigenous to Britain, and also found in Madeira, the Canary Islands, Brazil, the West India Islands, East Indies, Islands of the Pacific, &c. Fronds glabrous, triangularly elongate, from six inches to a foot long, tri-quadri-pinnatifid, light green; segments linear, entire, or obtusely bifid, rachis winged and decurrent on the stipes, which is densely covered with dark hair-like scales. Indusium cylindrical, scarcely two-lipped. Sori solitary in the axils of the upper segments.

7. T. scandens, Linnaus.—A beautiful evergreen stove species from Jamaica. Fronds slightly hairy, branching, ovate lanceolate, one to one and a half foot long, tripinnate; branches spreading; pinnules oblong-elongate, segments oblong-obtuse, pinnatifid, and decurrent at the base. Stipes terete; lateral, adherent to a scandent rhizome.

YYMENOPHYLLUM, Smith.—Name derived from hymen, a membrane, and phyllon, a leaf; an admirably characteristic appellation, referring to the membranous nature of the fronds.

Sori globose, or vertically oblong. Spore-cases sessile, seated round a columnar receptacle, which is included in an urceolate, bilabiate, marginal Indusium. Veins direct, free. Fronds simple, pinnate, bi-tri-pinnate or decompound, from one inch to a foot or more high, glabrous, or pilose. Rhizome cæspitose.—The species of Hymenophyllum have precisely the same habit and delicate membranous texture of frond, as those of Trichomanes. There are upwards of eighty described species, among which are two indigenous to Britain.—The technical character by which they are distinguished from Trichomanes is, the short sporangiferous receptacle which is included

within an urceolate bilabiate indusium, instead of being exserted beyond the margin. Fig. 74 represents a pinna of *H. dilatatum*, a species from New Zealand (nat. size), with a magnified indusium, turned back, showing the position of the sori.

1. H. tunbridgense, Smith.—A neat, low-growing evergreen, hardy or frame species, indigenous to Britain, and found in the Alpine districts of Europe, in Madeira, the Azores, Cape of Good Hope, South America, Tasmania, and New Zealand. Fronds small, pinnate, one to four inches long, olive green; pinnæ distichous, vertical, with linear segments, undivided or bifd, and spinulose-serrate. Involucres supra-axillary, solitary, sub-compressed, and spinulose-serrate. Rachis winged. Fronds lateral, adherent to a filiform creeping rhizome.

 H. unilaterale, Willdenow (H. Wilsoni, Hooker).—A neat evergreen, hardy or frame species, indigenous to Britain, and found in other parts of Europe, in Africa, South Ame-

rica and New Holland. Fronds lanceolate, pinnate, one to four inches long, olive green; pinnæ recurved, digitately-pinnatifid, sub-secund; segments linear and spinulose-serrate. Involucres supra-axillary, solitary, oblong, convex or inflated, entire. Rachis winged. Fronds lateral; adherent to a filiform, creeping rhizome.

3. H. hirsutum, Swartz.—A dwarf growing evergreen, stove species, from Jamaica. Fronds slender, reclining, two to three inches long, very pale green, bipinnatifid; segments linear-oblong, round at the apex, inferior ones largest, decurrent on the stipes. Fronds thickly covered throughout with forked or stellate hairs; lateral, adherent to a filiform creeping rhizome.



Rig. 74

SECT. IV. - Dicksoniere, J. Smith .

MITOLOBIUM, Descaux.—Name probably derived from sites, corn, and tolos, a lobe; in allusion to the situation of the fructification on the lobes of the pinnules.



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Sori globose, exserted, produced on the apices of the venules. Special and accessory indusium nearly equal, forming a reflexed bilabiate calyciform cyst, containing the spore-cases. Sporangiferous receptacle elevated, globose. Veins pinnate; venules simple or forked, direct, free. Fronds glabrous or pilo-glandulose, bi-tri-pinnate, from one to six feet high; the fertile sometimes contracted and densely soriferous, the sori of the opposite margins conniving. Rhizome creeping...This genus comprises a few free-growing species having great uniformity of habit, and may be considered as the herbaceous form of Dicksonia, being principally distinguished from that genus by having a more delicate texture, and a creeping or scandent rhizome. Fig. 75 represents a pinnule of S. adiantoides (nat. size) with a sorus (magn.)

1. S. punctilobum, J. Smith (Dicksonia, Hooker; Nephrodium, Michaux; Dicksonia pubescens, Schkuhr; D. pilosiuscula, Willdenow).—A hardy deciduous species, from North America. Fronds pilo-glandulose, lanceolate, subtripinnate, one to two feet long, very light green; pinnules oblong, adnate, deeply pinnatifid, with oblong rather

obtuse inciso-dentate unequal segments. Fronds lateral, adherent to a slender creeping rhizome.

2. S. adiantoides, J. Smith (Dicksonia, Humboldt).—An ornamental evergreen stove fern, from the West Indies, Brazil, and various other parts of South America. Fronds glabrous, triangularly elongate, sub-tripinnate, three to six feet long, bright shining green; pinnæ and pinnules triangularly elongate, acuminate, segments flat, oblong, slightly pinnatifid, round at the apex, decurrent, sublobate at the base on the upper side, and crenate at the margin. Fronds lateral, or terminal; adherent to a creeping rhizome.

3. S. davallioides, J. Smith (Davallia, R. Brown).—A very neat-looking, evergreen, warm greenhouse fern, from New Holland. Fronds slightly pubescent, deltoid, tripinnate, deep green, two to three feet long; pinnæ lanceolate; pinnules oblong, very membranous, deeply pinnatifid, with small oblong dentate segments. Fronds

lateral; adherent to a slender, elongated scandent rhizome.

S. rubiginosum, J. Smith (Davallia, Kaulfuss).—A straggling growing evergreen, stove species, from Brazil. Fronds pubescent, triangularly elongate, tripinnate, three to six feet long, rather dark green; pinnules oblong-acuminate, segments oblong, pinnatifid, round at the apex, largest next the rachis on the upper side, and obtusely dentate on the margin. Rachis and stipes of a reddish brown; lateral, adherent to a scandent rhizome.

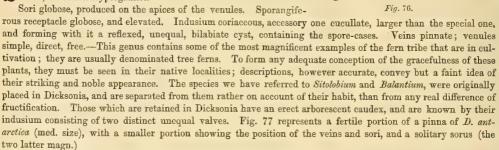
ALANTIUM, Kaulfuss.—Named from balantion, a purse; alluding to the form of the indusium.

Sori large, nearly globose, exserted, solitary on each segment, or by contraction of the fertile portion of the frond forming a thyrsiform cluster. Sporangiferous receptacle oblong, and elevated. Special and accessory in-

dusium coriaceous, nearly equal, forming a slightly reflexed oblong transverse bilabiate cyst. Veins pinnate; venules simple or forked, direct, free. Fronds glabrous, decompound, with the ultimate segments dentate.—This genus is established on a solitary species, a native of Madeira and the Azores. It is a large robust growing fern, very scarce in cultivation, and is remarkable for having large rather oblong sori and a criniferous decumbent rhizome. It is closely allied to Dicksonia, from which, however, it is distinguishable by its slightly oblong coriaceous indusium, and thick decumbent rhizome. Fig. 76 represents a portion of a pinna (nat. size) with an indusium (magn.)

1. B. Culcita, Kaulfuss (Dicksonia, L'Heritier).—An ornamental, evergreen, warm greenhouse fern, from Madeira. Fronds glabrous, deltoid, from three to five feet long, tri-quadri-pinnate; ultimate segments oblong, rather acute, and dentate at the margin. Fronds terminal, adherent to a thick decumbent, slightly creeping rhizome, which is densely clothed with hair-like scales.

ICKSONIA, L'Heritier.—Name commemorative of James Dickson, a British cryptogamist.



1. D. arborescens, L'Heritier (Balantium auricomum, Kaulfuss).—A very handsome, evergreen, warm green-house fern, from St. Helena. Fronds broadly lanceolate, bipinnate, three to five feet long of a shining green;



pinnules oblong-linear, acute, coriaceous, deeply pinnatifid, with roundish ovate, slightly concave lobes, crenate at the margin. Rachis, stipes, and midrib of pinnæ covered with woolly hair-like scales. Fronds terminal, adherent to an erect arborescent caudex, three or four feet high.



2. D. antarctica, Labillardiere (Cibotium Billardieri, Kaulfuss).—A very ornamental evergreen warm greenhouse species, from New Holland and Van Diemen's Land. Fronds lanceolate, sub-tripinnate, four to six feet long, deep green; pinnæ linear-lanceolate, somewhat drooping; pinnules linear-lanceolate, rigid, deeply pinnatifid, with ovate, acute, dentate segments. Stipes short, and, as well as the rachis, covered with hair-like scales. Sori confined to the lower pinnæ. Fronds terminal, adherent to an arborescent caudex. The largest specimen in cultivation is about five or six feet high.

3. D. squarrosa, Swartz.—A noble evergreen warm greenhouse fern, from New Zealand. Fronds ovate-lanceolate, tripinnate, from ten to fourteen feet long, dark green; pinnules linear-oblong, inferior distant, superior adnate, pinnatifid, with rather ovate

rior adnate, pinnathid, with rather ovate acute lobes, and small lacerated scales beneath. Rachis and stipes of a dark purplish colour, and densely covered with narrow dark-coloured scales. Stipes muricated. Fronds terminal; adherent to an arborescent caudex. The largest plant in cul-

tivation has a caudex about seven feet high, and nearly ten inches in diameter.

DIBOTIUM, Kaulfuss.—Named from kibotion, a little chest; in allusion to the form of the indusium.

Sori somewhat globose, produced on the apices of the venules, and superficially seated on the interior edge of the margin or sinus. Indusium coriaceous, consisting of two unequal valves, which form a reflexed adnate, bilabiate, cucultate cyst, containing the spore-cases, which are pedicellate. Veins forked, or pinnate; venules direct, free. Fronds glabrous or pilose, from five to ten feet long. Rhizome decumbent or erect.—The peculiar feature that distinguishes this genus from the other portion of Dicksonicæ is, its superficial gaping indusium, which consists of two unequal valves, the exterior differing in its manner of attachment from the inner valve or accessory indusium; in the preceding genera this exterior valve is formed of a reflexed changed crenule, but in this it is produced on the outer base of the sporangiferous receptacle, exactly opposite to, and of the same structure as, the inner one, therefore quite superficial, and independent of the margin of the frond, except in its attachment. Fig. 78 represents a pinnule of C. Barometz (nat. size), with an indusium (magn.)

1. C. Barometz, J. Smith (Aspidium Barometz, Willdenow; Cibotium glaucescens, Kunze).—A robust growing, evergreen stove fern, from China, Cochin-China, &c. Fronds glabrous, nearly erect, broadly-lanceolate, six to ten feet long, bipinnate, deep green; pinnules lanceolate-acuminate, petiolate, glaucous beneath, deeply pinnatifid, with linear-oblong acute, slightly crenate-serrate segments. Stipes densely clothed at the base with long woolly fulvous articulated hairs. Fronds fertile throughout, with one to three sori on each margin of every fertile segment; lateral, adherent to a thick decumbent rhizom; which, from its woolly appearance, has given rise to the fabulous story of the Barometz, or the vegetable or Seythian lamb.

2. C. Schiedei, Schlechtendahl and Chamisso.—An elegant, evergreen, stove species, from Mexico. Fronds hairy, broadly lanceolate, six to ten feet long, glaucous beneath, bipinnate, light green; pinnules membranous, drooping, lanceolate-acuminate, pinnatifid, inferior distant, superior adnate, acute, margin crenate, or slightly lobed. Stipes densely clothed at the base, with long bright brown, woolly, articulated hairs; terminal, adherent to an arborescent caudex, attaining the height of two or three feet. Sori confined to the lower pinnæ, and from three to six on each margin of the fertile segments.



Sub-Order-Polycodiacex: Tribe-Cyathex.

This very distinct natural tribe contains but few genera, and probably not more than seventy or eighty species as described by authors. They are all of robust arborescent growth, and, with the genus Dicksonia, may be you, iii.

justly styled the giants of the Fern race. They have generally hollow trunks, varying in height from a few feet to forty, and in many instances fifty, feet, bearing a large crown of usually decompound fronds; the bases of which, becoming indurated, form part of the solid structure of the trunk, or are deciduous, falling away by a distinct articulation, leaving permanent spirally arranged scars around the caudex. Their sori are round, globose, intramarginal, medial, costal, or axillary, furnished with a calyciform, lateral, interiorly-attached, special indusium; naked or furnished with articulated hairs, involving the spore-cases, which are usually compressed, sessile, their receptacle being elevated, gibbous, or columnar. From the Dicksonieæ they are distinguished by the position of the sori, which is medial, axillary, intramarginal, or costal, instead of being, as in Dicksonieæ, always terminal, and usually marginal. All the species belonging to this tribe that are now in cultivation, have been introduced within the last seven years; two of them, indeed, are enumerated in the "Hortus Kewensis" as having been introduced many years since, but they had long disappeared from English gardens.

CYATHEA, Swartz.—Name derived from kyatheion, a little cup; in reference to the form of the indusium.

Sori medial, or costal, uniserial, usually axillary. Spore-cases compressed, arising from a globose receptacle. Indusium inferior, with an operculiform apex, subsequently calyciform, entire or unequally lacerated on the margin. Veins pinnate; venules direct, free. Fronds pinnate to decompound, from six to ten or fifteen feet long; ultimate pinnules pinnatifid, and frequently articulated with the rachis. Stipes aculeate or squamose.—The present genus, which is the type of the tribe, differs from Hemitelia principally in the formation of its indusium, and from Alsophila in the sori being naked, or furnished with a hairy indusium or a small lacerated scale at its base. There are many species described by authors, and four of them are in cultivation. The

character by which the genus is distinguished is very obvious, namely, the calyciform or cup-shaped indusium, which resembles the cupule or cup of an oak. Fig. 79 represents a pinnule of *C. elegans* (nat. size), with a segment showing the position of the veins and sori, and a solitary sorus (magn).

1. C. arborea, Smith.—A noble evergreen stove Fern, from Jamaica. Fronds lanceolate, sub-tripinnate, six to ten feet long, rigid, coriaceous, dull green; pinnules lanceolate, scaly beneath; segments linear-oblong, entire, acute, slightly falcate, all, except the lower pair, adnate-decurrent at the base and cremulate at the margin. Rachis and stipes dark-coloured, aculeate; terminal, adherent to an erect caudex. The tallest plant in cultivation is about three feet high.

2. C. elegans, Heward.—A beautiful evergreen stove Fern, from Jamaica. Fronds glabrous, broadly lanceolate, six to twelve feet long, tripinnate, light green; pinnules lanceolate; segments linear-oblong, entire, membranous, slightly falcate, adnate, round at the apex, crenately serrate at the margin. Rachis and stipes muricate at the base, and densely covered with light-coloured deciduous chaffy scales. Fronds terminal, articulated with an erect arborescent caudex. The tallest plant in cultivation is eight feet high, and four inches in diameter.

3. C. dealbata, Swartz.—A very beautiful evergreen warm greenhouse species, from New Zealand. Fronds glabrous, broadly lanceolate, tripinnate, five to seven feet long, bluish-green above, and very glaucous beneath; pinnules lanceolate, segments oblong-linear, acute, slightly falcate; all, except the lower ones confluent at the base, and crenulate at the margin. Stipes scaly and muricate, especially at the base. Fronds terminal, adherent to an erect caudex. The tallest plant in cultivation is nearly two feet high.

4. C. patens, Hort.—A slender growing evergreen stove species, from Jamaica. Fronds broadly lanceolate, tripinnate, six to nine feet long, yellowish green; pinnules lanceolate, spreading, segments linear-oblong,

Fig. 79

acute, inferior ones distinct and often pinnatifid, with round lobes, the superior adnate-decurrent. Rachis of a light brown mahogany colour, and, as well as the stipes, aculeate; terminal, adherent to a slender caudex, three feet high.

MEMITELIA, R. Brown (Cyatheæ sp. of Authors; Cnemidiaria, Presl).— Name derived from hemi, half; and teleia, perfect; alluding to the indusium, which is semi-calyciform, or resembling a half cup.

Sori medial, uniserial, sub-marginal, or irregular; receptacle globose. Indusium semi-calyciform, interiorly attached, becoming reflexed, lunulate. Veins simply or pinnately forked; venules free, or the inferior ones angularly anastomosing, forming a costal arch, and other areoles between the sinus and midrib of the segments. Fronds pinnate or bipinnate, glabrous, squamose, or aculeate, from four to ten feet long, with broad obtuse, lanceolate or falcate segments.—The value of generic characters will, of course, be estimated by what is considered

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to constitute a generic difference—whether a peculiarity of habit, fructification, or venation, or whether a combination of two or more of these. It often happens that the species arranged under a genus, coincide with the characters assigned to it, with perhaps a solitary exception; this anomalous species, partaking of the characters of what are considered two distinct genera. The genus now before us, established by Brown, originally included H. capensis, H. horrida, &c., but it was subsequently restricted to those species which have anastomosing costal

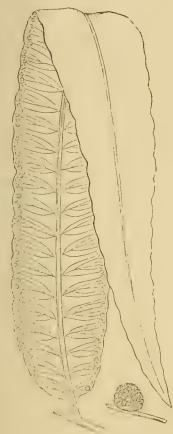


Fig. 80.

venules. Of the four species we have placed here, two have the venules thus anastomosing, one has them occasionally anastomosing, and in the other they are quite free. Comparing the venation of this genus with what occurs in Adiantum and Stenochlæna, we cannot range these species under different genera merely on account of their slight variation of venation, which only anastomoses and is never truly reticulated; consequently we have retained in Hemitelia all those species which have a permanent semi-calyciform indusium, thus excluding H. capensis, which has only a lacerated scale at the base of its sori. Fig. 80 represents a pinna of H. speciosa (med. size), with a sorus (magn.).

1. H. speciosa, Kaulfuss .-- A beautiful evergreen stove Fern, from South America. Fronds glabrous, broadly lanceolate, from four to six feet long, rather erect, pinnate, bright shining green; pinnæ linear, narrow-lanceolate, 10-15 inches long, and  $1-1\frac{1}{2}$  wide, petiolulate, obliquely truncate at the base and crenate at the margin. Stipes scaly, and muri-

cate at the base; terminal, adherent to an erect arborescent caudex, the largest in cultivation is about two feet high. Sori uniserial, sub-marginal. The lower venules in this species occasionally anastomose, forming an angular costal arch.

2. H. grandifolia, Sprengel.—A beautiful evergreen stove Fern, from Trinidad. Fronds glabrous, ovate-lanceolate, three to four feet long, pinnate, bright shining green; pinnæ linear-lanceolate, a foot long, sessile, broad, pinnatifid, with very obtuse falcate segments, finely serrated round the apex. Sori medial, uniserial, continued round every sinuosity of the pinnæ, with a solitary sorus on each venule, the inferior ones, and occasionally others, anastomosing, and thus forming an angular costal arch. Stipes aculeate, with a scale on each prickle; terminal, adherent to an erect caudex, which attains the height of four or five feet.

3. II. horrida, R. Brown.-A noble evergreen stove Fern, from Jamaica and other West

Indian Islands. Fronds glabrous, broadly lanceolate, pinnate, five to ten feet long, bright shining green; pinnæ sessile, broad, deeply pinnatifid, with approximate lanceolate, acuminate, slightly falcate segments, crenate-serrate at the apex. Sori continued round every sinuosity of the pinnæ. Lower venules anastomosing, forming an angular costal arch, with others between the sinus and midrib of the segments. Rachis and stipes aculeate, with a scale on each prickle. Fronds terminal, adherent to an erect arborescent caudex, the largest in cultivation being nearly five feet high.

4. H. Hostmanni, Hooker.-An ornamental evergreen stove species, from Guiana. Fronds glabrous, lanceolate, bipinnate, five to seven feet long, deep green; pinnules lanceolate, pinnatifid, with oblong linear-obtuse sub-falcate segments, round at the apex, and entire at the margin, upper ones decurrent at the base, forming a winged rachis. Sori medial, and usually axillary. Fronds terminal, adherent to an erect caudex, two feet high. Only a solitary specimen of this genus is known in cultivation; it was introduced to Kew in 1845.

LSOPHILA, R. Brown.—Named from alsos, a grove, and phileo, to love; in reference to the localities preferred M by these plants.

Sori round or sub-globose, sometimes becoming confluent, medial, or axillary, naked or furnished with a lateral interior indusium, which is sometimes very small or hair-like. Spore-cases usually compressed, with the sporangiferous receptacles slightly globose or columnar. Veins pinnate; venules simple or forked, direct, free. Fronds large, bipinnate to decompound; ultimate pinnules pinnatifid. Stipes and rachis often aculeate, with the midrib of the



segments scaly.—A somewhat heterogeneous assemblage of species is arranged under this genus, which contains nearly half of the Cyatheæ. In habit and general appearance they resemble Cyathea, but differ from them by not having a cup-shaped indusium. In those species which have the sori naked, there is a considerable analogy to Polypodium, from which they are not easily determined by small fragments in herbaria, although in a living state they are easily recognized by their arborescent habit, and usually compressed spore-cases with an elevated sporangiferous receptacle. Fig. 81 represents a pinnule of A. articulata (full size), with a sorus divided vertically and a little magnified, showing the elevated receptacle.

1. A. australis, R. Brown.—An ornamental evergreen warm greenhouse fern, a native of New Holland and Van Diemen's Land. Fronds glabrous, ovate-lanceolate, three to four feet long, bipinnate, pale green; pinnules linear-acuminate, pinnatifid, with rather ovate-acute, slightly falcate segments, entire at the margin. Stipes and rachis muricate, scaly at the base; terminal, adherent to an arborescent caudex.

2. A. articulata, J. Smith.—A noble evergreen stove species, from Jamaica. Fronds broadly lanceolate, bipinnate, six to eight feet long, deep green; pinnules lanceolate, deeply pinnatifid, and, as well as the pinnæ, articulate with the rachis, scattered over with small brown scales beneath; segments oblong-linear, slightly falcate, coriaceous, and crenulate at the margin. Rachis and stipes aculeate, scaly; terminal, adherent to an erect, often branching caudex, the tallest in cultivation being five feet high.

3. A. capensis, J. Smith (Hemitelia, R. Brown; Amphicosmia riparia, Gardner).—An ornamental evergreen warm greenhouse fern, from the Cape of Good Hope. Fronds glabrous, ovate-lanceolate, bipinnate, three and a half feet long, light green; pinnæ lanceolate, slightly winged; pinnules linear-acuminate, deeply pinnatifid, with oblong-linear, acute, bluntly dentate segments. Stipes with scales at the base, some being scattered on the rachis; terminal, adherent to an erect arborescent caudex. At the base of the stipes a very singular development is often found in the form of a fascicle of deformed or filiform pinnæ, which cover the apex of the caudex, and so much resemble a species of Trichomanes, that Kaulfuss, in his Enumeratio Filicum, has described it as belonging to that genus, though with a query, naming it Trichomanes (?) cormophyllum.

4. A. ferox, Presl.—A very rough-looking evergreen stove Fern, a native of South America, Jamaica, and other West Indian Islands. Fronds glabrous, broadly lanceolate, five to seven feet long, bipinnate; pinnules linear-lanceolate, rather membranous, deeply pinnatifid, with linear-oblong, slightly-falcate, rather acute segments, serrate at the margin. Rachis, stipes, and midrib of pinnæ aculcate. Fronds terminal, adherent to an erect, often branching caudex; the tallest of which in cultivation is four feet high. Indusium very small, hair-like.

5. A. villosa, Presl (not Kunze; Cyathea villosa, Humboldt; Chnoophora Humboldti, Kaulfuss).—A beautiful evergreen stove species, from Columbia. Fronds broadly lanceolate, five to seven feet long, bi-sub-tri-pinnate, lightish green, and covered throughout with narrow scales and hairs; pinnules linear-acuminate, about four inches long, pinnatifid, with oblong slightly falcate segments, blunt at the apex and entire at the margin. Stipes and rachis aculeate, scaly; terminal, adherent to a stout caudex, about a foot high. Indusium lacerated, hair-like.

6. A. pruinata, Kaulfuss (Polypodium pruinatum, Swartz).—A beautiful evergreen stove Fern, from Jamaica, Brazil, and Chili. Fronds ovate-lanceolate, tri-quadri-pinnate, from four to six feet long, light green above and glaucous beneath; ultimate segments linear-oblong, acute, pinnatifid, decurrent at the base, slightly falcate, and acutely lobed. Rachis and stipes clothed with soft woolly hairs, which are more or less scattered throughout the whole frond; terminal, adherent to a branching caudex, the tallest being about two feet high.

# Garden Dints for Amateurs.

MHERE alterations in any of the departments of the garden are contemplated, now is the time to commence them, so that the work may be performed while the weather is suitable and before the earth is locked up by frost. Few objects are more unsightly in a gentleman's garden than an uneven lawn, or one upon which the grass is what is termed patchy, that is, where rough tufts of couch or other coarse grasses grow out from among the finer kinds and impart a ragged appearance to the surface. Not less objectionable is a lawn that burns in patches in dry weather, some parts being quite green and others as brown as the gravel walks. Burning arises from insufficient nutriment in the soil, or from the good soil being deeper in some places than in others. About suburban villa residences it is not unusual for the builders to get rid of brick or any other rubbish after building by burying it in the garden, coating the same over with soil, and hence, if the ground is levelled and laid down with grass without trenching, the defect before referred to will soon present itself in a very offensive manner. Our own plan of laying out a garden is as follows:—We first determine the surface level, and set to work at one end and trench the whole ground two to three feet deep, taking care to leave the bottom of each trench solid, and so that the soil that has been moved may be the same thickness over the whole area. When the whole has been trenched over, the men are set to "tread" it, that is, they walk

about until the ground is perfectly consolidated and as level as a billiard table; then the walks and beds are marked out, and the turf is laid down, taking care, in cutting it, to have it as nearly of a thickness as possible, as, upon that, the evenness of the surface will in a great measure depend. It may then receive what may be termed a rough beating, just to smooth the most uneven parts, but the finishing beating cannot be given until the ground has been thoroughly soaked by rain. If the surface soil is poor, an inch or two of rotten manure or leaf mould must be pricked in previous to the final levelling, or some fresh soil may be added over the entire surface. The best time to lay turf is in the autumn and early winter months; at any rate, if it can possibly be avoided, it should not be laid later than the end of February. In forming the walks, Mr. Beaton's directions as to concrete should be followed, as requiring less material, and being the best and cheapest in every respect. Planting may be performed now, more especially with deciduous trees and shrubs, but, if we must have our choice, we would rather plant evergreens the end of April and through May than at any other time in the year. This rule is more to be observed if the plants are to be removed from warm nursery beds to very exposed situations. It is quite unreasonable to expect such plants to succeed if removed late in the autumn or winter.

In the Flower Garden, any plants which it is intended to preserve through the winter should be taken up without delay; and if, after they are potted, you can assist them with a little bottom heat, it will be very beneficial in starting them. Take care to preserve plenty of old roots of Salvia patens, which, when properly managed, makes a splendid blue bed. Nice compact plants of Calceolarias and Scarlet Pelargoniums should also be preserved. As soon as the leds are cleared of plants, dig them over and stock them immediately with bulbs or nice dwarf shrubs from the reserve garden.

The Greenhouse plants are all snug in their winter quarters, therefore give plenty of air and do not use artificial heat until frosty weather compels you to do so, unless the weather should prove very moist, and then a little fire may be necessary in the daytime to dispel the damp. Heaths do not require to be kept so warm as plants from New Holland, Australia, &c., &c., and hence, where it is a matter of necessity to grow them together, care must be taken to suit the temperature to both tribes. Pelargoniums are now growing freely, but do not attempt to force them, rather keep them dwarf and stocky until nature comes to your assistance with the new year. Fancy Pelargoniums, as we have before remarked, require a little more heat than the common kinds. Water them cautiously, thin out a few of the smaller leaves occasionally, and train them into proper form as they require it or opportunity offers. The larger plants of both kinds for the May shows may be put into their blooming pots. Take great care of plants in pits and frames; keep them dry and protect them in time.

Among Florists' Flowers, Tulips, if not already planted, must be delayed no longer, or they will suffer. Finish potting layers of Carnations and Picotees, and get them into their winter quarters. Protect Auriculas properly, and attend to Pinks and Heartsease both in pots and beds.

In the Fruit and Kitchen garden, proceed with the pruning of bush trees and the more hardy kinds of wall trees, but leave the Apricots, Peaches, &c., until after Christmas. Protect in frames, pits, or open sheds the Walcheren and Snow's Winter White Brocoli, now coming into use, and, if properly managed, it will give a supply until March. Proceed with trenching and ridging vacant ground in favourable weather; wheel manure, soil, &c., on frosty mornings. On light favourable soils a crop of Early Peas and Royal Cluster or Fan Beans may be sown; but, upon heavy soils, a few transplanted from pots or boxes in February will be preferable.—P.

## DECEMBER.

This is a month in which the garden operations are especially dependent upon the weather, for if the ground is frost locked, but little can be done in that direction. Still, if new fruit-borders have to be formed, flower-beds renewed, or stations for choice plants prepared, advantage should be taken of such weather to get the work performed. If the frost is very intense, carts and horses may sometimes be used where the wheel-barrow, under ordinary circumstances, could only be admitted, and hence much labour would be saved. Heaps of soil and manure in the compost yard must also be attended to, either by removing the frozen surface or by turning the heaps throughout, so as to expose them as much as possible to the action of the atmosphere.

There is another point generally neglected in suburban gardens which claims special attention at this season, and that is the thinning or pruning of shrubbery borders. If the garden is of any size, the boundary line is generally planted with common forest trees and shrubs underneath, not less to produce immediate effect than to secure the privacy of the premises. Desirable as such a thing may be, care should always be taken to thin in time, so that each plant may assume its proper form, and hold its proper place in the arrangement. Then all will be complete and satisfactory; but when trees are

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allowed to grow up year after year until they become a tangled mass, it requires great judgment and considerable labour to make them assume a satisfactory appearance. An example of neglected thinning we have now before us, where it has become indispensably necessary to take down three-fourths of the trees, or in a few years they would completely smother the under-shrubs. The covenants in leasehold places, as to trees, are generally of the most absurd description, and in this instance, though it is doing positive good to the premises, the proprietor, if he liked to enforce it, could recover a penalty of £50 for every tree cut down. In this case, the lessee is only allowed to cut down "dead or worn-out" fruit-trees, and then he is to re-plant with trees of the same kind (superior varieties, of course, would not do!) and to nurse them until they are thoroughly established. In such cases the law's requirements are almost as bad as its "delays," and fortunate is the man who has nothing to do with either.

The Greenhouse plants are, or should be, in statu quo, for the less they grow in this dark month the better. Any, however, which require training must be looked to before the end of the year, for January will bring its work, which must be attended to. If you are obliged to use fire heat, take care that the plants are properly attended to with water, for if the pots get dry at the bottom, where the most active roots are generally situated, the plants will soon tell tales. Examine the Pelargoniums, and remove decaying leaves, more especially upon the Fancies, or decay will soon be communicated to the branch, and then it, as well as the leaf, will perish. You cannot be too particular in this among soft-wooded plants. Remove decaying leaves directly they are perceived, and keep every part of the plants as clean as possible. Florists' Flowers this month will merely require protection, as it is presumed they are potted, and in their winter quarters. Auriculas, Carnations, and Heartsease will suffer more from undue moisture at this season than from drought; but endeavour to observe the happy medium, and give abundance of air at every favourable opportunity. Proceed with pruning in the fruit and kitchen garden, and continue to manure and trench ground where vacant. On dry frosty mornings, ground that has been ridged up some time may be broken up with a strong fork or pick, so as to expose as much of the soil to the weather as possible. Protect growing crops of the more tender kinds, and early Peas or Beans, just breaking through the ground, will be benefited by having some dry soil or ashes thrown among them. In bad weather Pea-sticks may be pointed, and many other things done that will forward the work in the spring.—P.

### JANUARY.

With the new year the busy season of the gardener's troubles commences; for as the days begin to lengthen plants of all kinds, both in-doors and in the open air, will begin to move, and most of them may be forced on a little with advantage, for you can never do wrong in exciting the growing principle when lengthening days are in your favour. Now you may apply, by raising the temperature gradually, a little extra stimulus to your Pelargoniums; and as soon as they begin to grow freely, move the second lot into their blooming pots. Young stock for early blooming must also be potted, and a few of the early forcing kinds which are showing bloom may be introduced into a little additional heat. Cinerarias, for late blooming in May, must be kept in cold frames or pits, taking care to guard them properly from damp and frosty weather. Pot successional plants, and some of the early blooming kinds may be forced very gently into bloom. Hard-wooded greenhouse plants will also begin to move; therefore assist them a little, and take special care that they are not suffering for want of moisture at the roots; for after severe frosts, when fires are obliged to be used, the plants are liable to get dry from evaporation by the sides of the pots, when the surface at the same time may appear sufficiently moist. Camellias are now advancing rapidly, therefore give them an occasional dose of manure water, and syringe the plants twice or thrice a week with clean tepid water until the flowers begin to expand.

If alterations in the Pleasure and Flower Garden have not been completed, proceed with them as fast as possible, so as to get your work forward and the garden neat before the flowers of spring begin to make it attractive. At the end of the month walks may be edged, cleaned, and gravelled if necessary, and the grass must be kept regularly rolled, and quite clean. Of course, all the leaves and other rubbish have been cleared from the borders, and now the commoner shrubs and roses may be pruned, and afterwards the borders must be properly cleaned off for the season. The subject of pruning shrubbery plants so as to get each into appropriate form, has never been properly handled; they are allowed after first planting to grow into a confused mass, and hence it is almost impossible to get them into proper form afterwards without very severe cutting. The gardenesque style of planting and managing shrubs has hardly received a practical exemplification at present, but if it was once properly carried out, so that each plant and tree could assume its proper form, no doubt it would be much approved, at least by persons of taste, who admire plants for their own sakes, and not as mere screens from

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unsightly views, or shelters from cutting winds. Vacant beds in the flower garden must be frequently forked over, and, if they need it, may receive a dressing of leaf-mould or rotten dung.

Should the weather prove severe, tulip beds must be protected with mats, as much against undue moisture as against severe cold. Auriculas and Polyanthuses must have plenty of air and a little water at the roots occasionally; but keep the foliage dry, more especially the centre of the plants. Carnations and Picotees generally suffer more from being unduly coddled than from cold; give them plenty of air, but keep them rather dry both at the root and foliage. Pinks in beds must be guarded against snails, and after frost the soil, on a dry day, must be compressed around the roots. Should the weather be severe, or the winds very cutting, a few evergreen branches, stuck among the plants, and also in the Heartsease beds, will protect them much.

Complete the pruning in the Fruit Garden as soon as possible, and dust the Gooseberry trees over with lime and soot to eradicate moss, and also to prevent the ravages of the caterpillar. This dressing will also, to some extent, prevent the ravages of birds upon the buds. Finish planting fruit trees, and mulch those previously planted. Look over growing crops, and if the weather is favourable, run the hoe through the Cabbage and Spinach crops. Sow successional crops of Peas and Beans, also Radishes, which protect from birds and vermin. Cover Sea-Kale and Rhubarb for forcing, and attend, as directed last month to the hoeing and stirring of soil in favourable weather.—P.

## ON THE BAROMETER.

By E. J. LOWE, Esq., F.R.A.S., M.B.M.S., &c.

MHE barometer, when well understood, is a very essential instrument in the hands of the gardener or the agriculturist. By it we are enabled to measure the weight of the atmosphere to a great nicety. It is to the celebrated Italian mathematician and philosopher, Evangeliste Torricelli, that we are indebted for the invention of this instrument; this took place in the year 1643. In all probability, great things would have been accomplished by this eminent man had not death put an abrupt end to his brilliant career when in his 40th year. It was a simple experiment which showed Torricelli that the air possessed weight. A glass tube, which he had scaled at one end, was filled with mercury; when full, he placed his finger on the other end, whilst he inverted the tube in a dish of quicksilver; on then removing the finger, he found the mercury fell to a certain height each time the experiment was made; and it at once occurred to this philosopher that the atmosphere pressed upon the quicksilver in the dish, and by this means forced a certain quantity into the tube, or rather, in his experiments, held a certain portion in suspension.

We shall not linger with the description of the barometer, as the above experiment shows in so clear a manner its principle of action.

In 1664, the excellent French mathematician and philosopher, Blaize Pascal, repeated Torricelli's experiment; and by using various fluids, discovered that the lighter the specific gravity of the fluid used, the higher was it forced into the tube. He next made two tubes exactly alike, and filled each of them with mercury, and placing one at the foot of a mountain, ascended with the other; for, thought Pascal, the atmosphere has weight, if I ascend an elevation, and thus pass through a portion of it, there will not be so much pressure as in the valley; at least, so says theory; and practice bore out theory, for the barometer at the base showed a pressure of 28 inches, whilst the other gradually fell as he ascended, until, at the summit, it was only 24.7 inches. On descending, it again rose, and on placing the two side by side, they both indicated 28 inches. In 1666, the Irish philosopher, Robert Boyle, found that our atmosphere was elastic, and could be compressed; and at about the same time, the French philosopher, Edme Mariotte, showed that its weight was in proportion to the pressure exerted upon it. The barometer has now been made to register itself in an admirable manner, by Mr Lawson of Bath, in his "Atmospheric Recorder."

As with every other philosophical instrument, no dependence can be placed upon the barometer, unless it has been found correct by comparison with a standard instrument. Ordinary barometers are almost always inaccurate, for various reductions and corrections are obliged to be made, and these can only be applied to certain instruments. Wheel barometers, and those whose mercury is confined in a leathern bag, must be inaccurate.

The following corrections ought to be attended to, in order to obtain the true reading of the baro-

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meter:—1. A reduction for the temperature of the mercury to reduce the reading to the freezing point. To show the necessity of this: suppose the mercury is at a temperature of  $75^{\circ}$ , the barometer will indicate a pressure a tenth of an inch too high. Most instruments have a thermometer attached to them for this purpose, yet, from it we only attain an approximation, for it merely gives the heat of the apartment in which the instrument is placed, and not that of the mercury; to give the latter, the bulb of the thermometer should be plunged into the quicksilver; for ordinary purposes, however, the former is sufficiently near. A barometer ought to be placed in a room not subject to much variation of temperature; one cool, and without fire in the morning, and with a blazing hearth in the evening, should be avoided, and in like manner should one cool as a cellar (being in shade) at one part of the day, but with a hot sun shining in at the windows at another period. An outer wall must also be avoided.

2. Another correction, that for capillarity, it is necessary to explain. The tubes of barometers below a certain diameter (a size greatly beyond that of most instruments) are influenced by capillary action; i. e. the action in the tube is greater than in the cistern of the barometer, and the more so, the smaller the diameter of the tube. Beyond a diameter of six-tenths of an inch, this influence all but ceases. For ordinary purposes, gently rapping the barometer two or three times before observing its

height, will sufficiently correct it for capillarity.

3. A third correction is of great importance, viz., that for the depth of mercury in the cistern of the barometer; and this correction, of course, cannot be applied to the wheel barometers or those having leathern bags. When the barometer rises or falls, the depth of mercury in the cistern becomes less or greater; so that at one time we may be measuring our barometer, not from the surface of the mercury in the barometer, but a few tenths of an inch below or above the surface. In order to overcome this error, the scale of inches is made to move by rack-work, and a rod attached to the scale extends to the cistern, the lower end of the rod terminating in a point. This rod is moved by rackwork (of course, bringing the scale of inches with it) higher or lower, as the case may be, until the point just touches the surface mercury, and by this means we have the exact length of the mercurial column.

There is another barometer which has been invented within the last two or three years, by M. Vidi of Paris, upon a new principle, and is, from its action, called the Aneroid Barometer. The atmosphere presses upon a metallic box, from which the air has been exhausted, and which has then been hermetically sealed. This instrument has not been brought to a state sufficiently correct for scientific purposes. However, for ordinary use, it is accurate enough; indeed, much more so than any other form of the barometer, excepting the standard one; and being very portable, and not costly, it is an excellent instrument for gardeners.

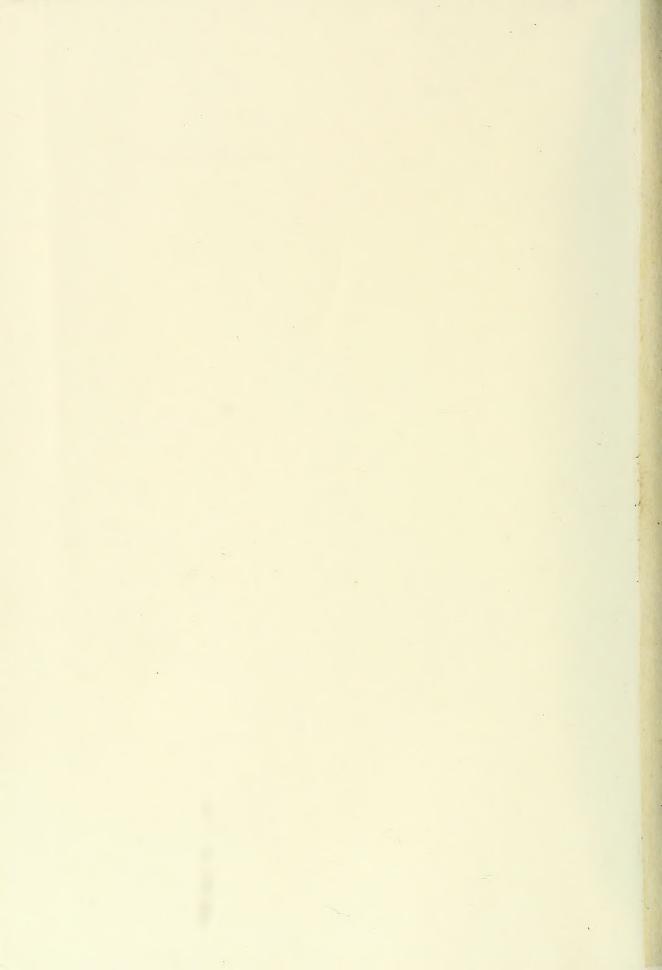
Too much confidence must not be placed on the predictions of a barometer, for the indications of fair, rain, or change, engraved on the instrument, are merely placed there in a popular sense. Strictly speaking, the barometer merely indicates the weight of the atmosphere, i. e., the weight conjointly of the dry and wet air, or, in other words, the combined pressure of the aqueous and gaseous atmospheres. If the barometer falls rapidly, most persons look with confidence to the approach of rain. Now, if we consider for a moment, this fall can but little indicate it: for in England, as an example, the range of pressure is 3 inches, from 28 to 31 inches, and the mean pressure about 29½ inches; of this, 29 inches is the pressure of the gaseous or dry air, whilst only half an inch is that of the aqueous or wet air, or that portion from which we derive moisture. The barometer alone is but a poor guide; but, taken together with the dry and wet bulb thermometer, it becomes a much better prognosticator. Supposing, for instance, the barometer is descending, the air containing almost as much moisture as it can sustain without rain at a certain temperature; if the temperature, as indicated by the bulb thermometer, is descending, we may with confidence look out for rain, for we then know that, unless the moisture in the atmosphere decreases, the temperature of the air will soon have descended below the point where it can no longer hold the same amount of water in suspension, and rain must fall.

In an age like the present, when science is being studied by all classes of the community, the gardener and the agriculturist should not be behindhand in meteorology; and it is hoped that ere long all well educated men in these branches will take daily observations on the weather, and in such a manner that their observations may not only be of the greatest use to themselves, but also to the succeeding generations.









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